ELECTRICAL REVIEW

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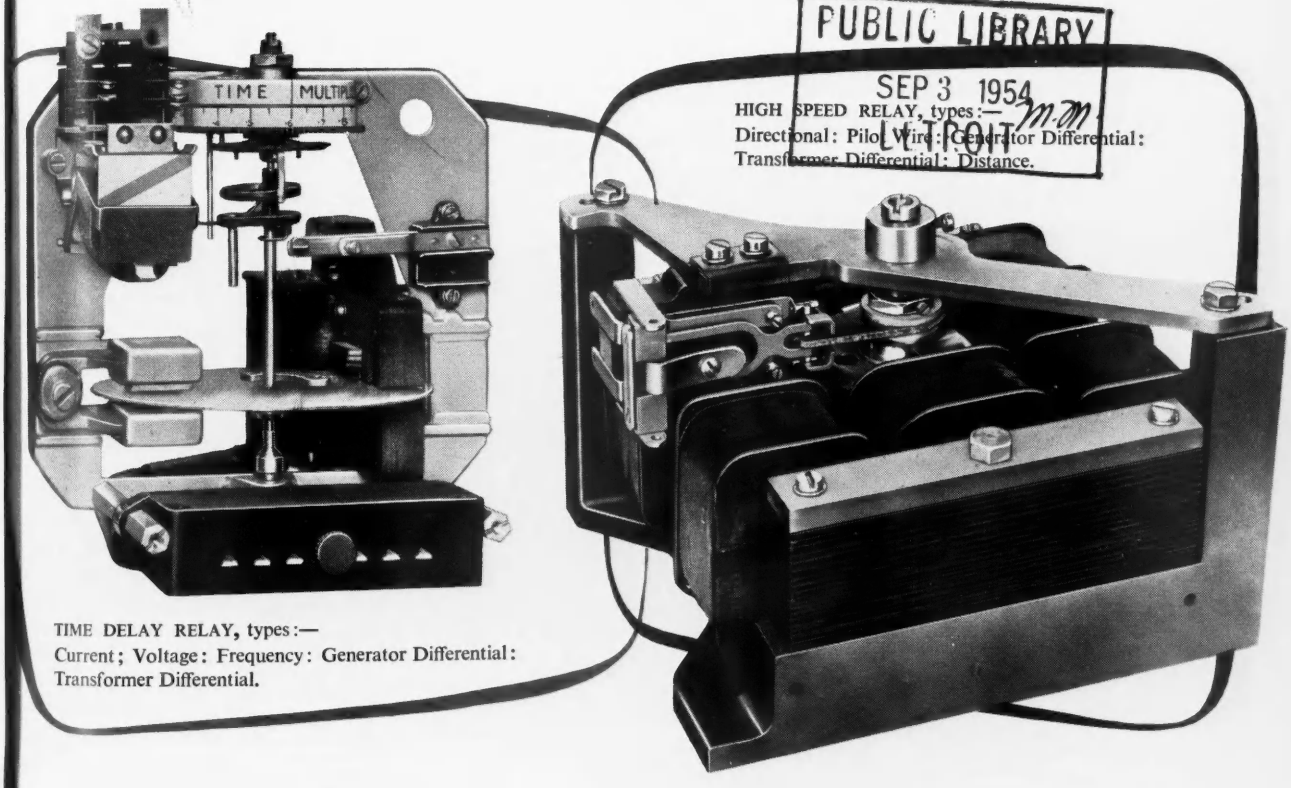
DETROIT

'ENGLISH ELECTRIC'

Standardised Protective Relays



TIME DELAY RELAY, types:—
Current; Voltage: Frequency: Generator Differential:
Transformer Differential.

HIGH SPEED RELAY, types:—
Directional: Pilot Wire: Generator Differential:
Transformer Differential: Distance.

These two basic types cover all A.C. relay applications

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Relay Department, Stafford

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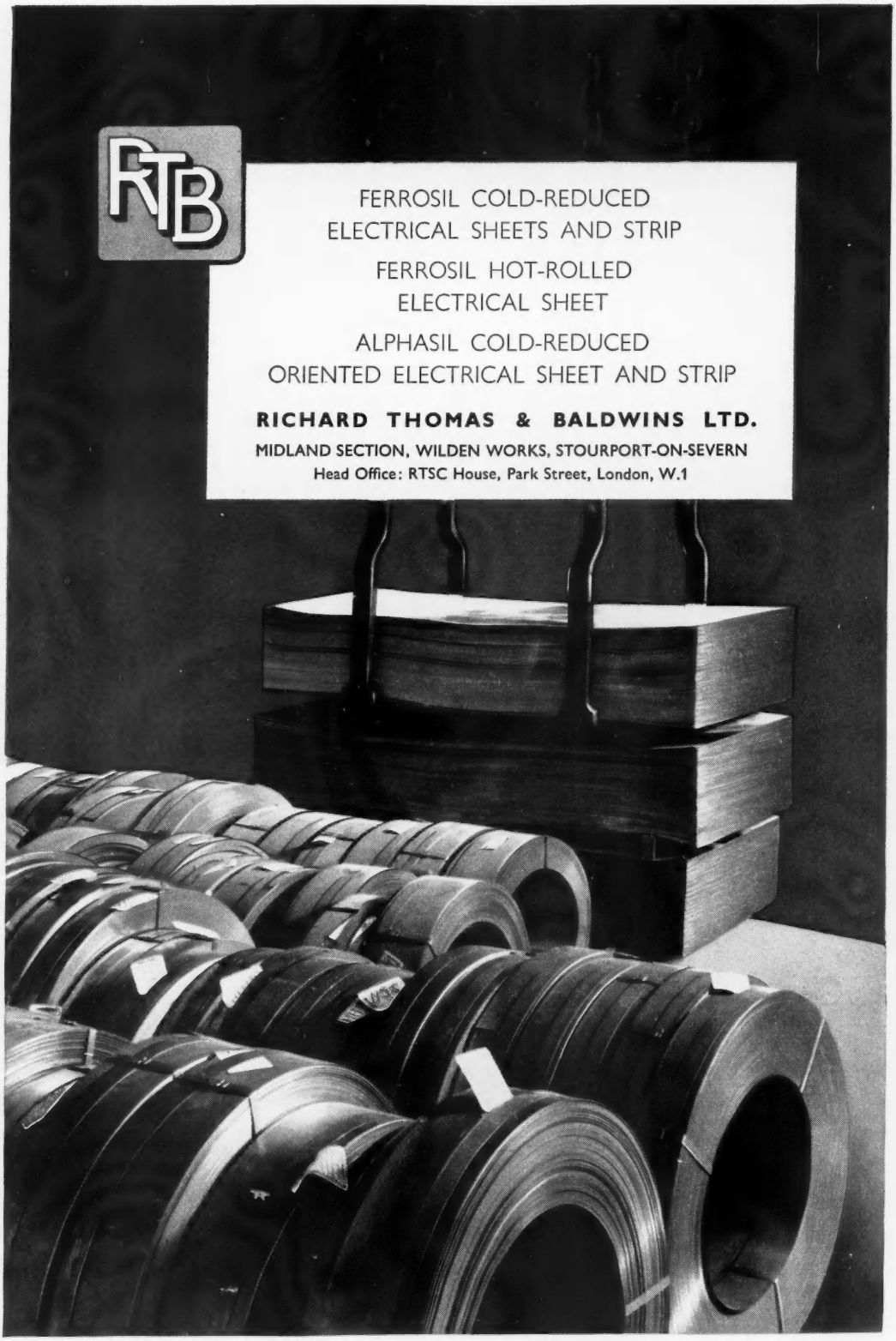
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Photograph by courtesy of "Nigeria"

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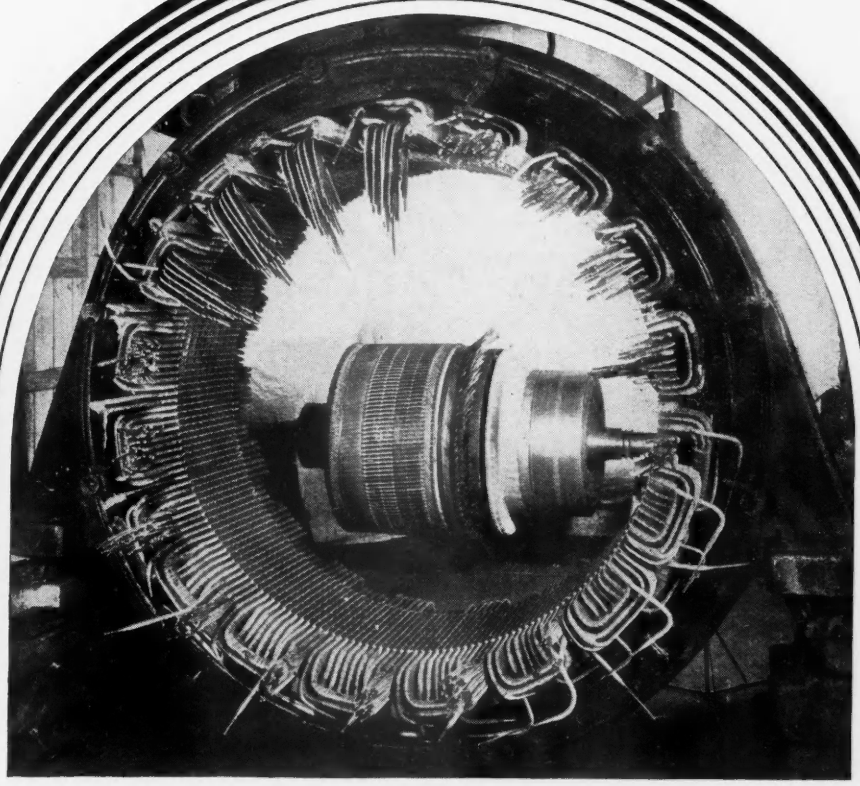

Variety. Collins' comprehensive experience ensures there is always at least one interesting job going through their works. Here is the stator of a 1250 H.P., 6,600 V., 246 r.p.m. English Electric Motor undergoing complete rewind. In the background is an Armature from a 250 H.P. B.T.H. C.H.T. variable speed motor.

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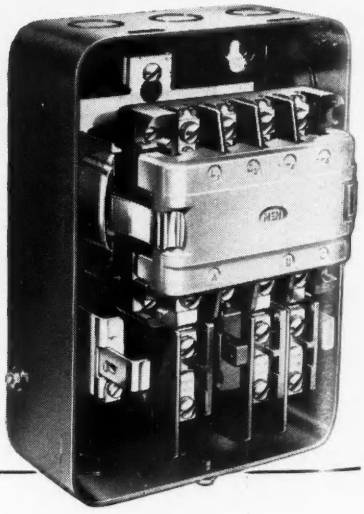

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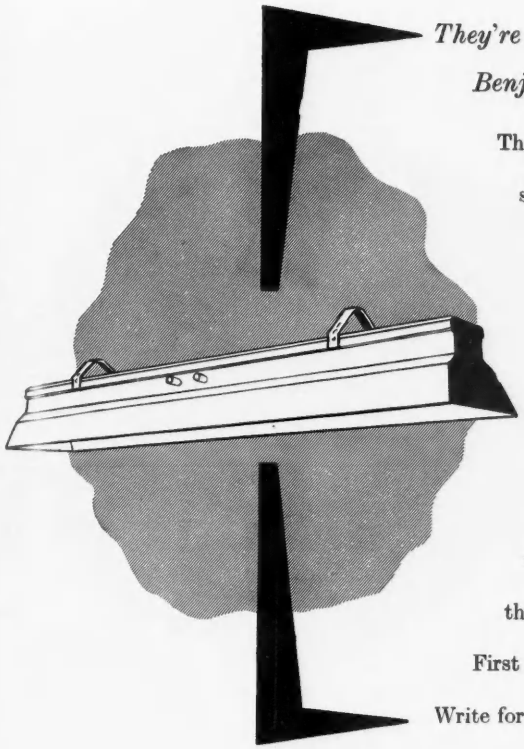

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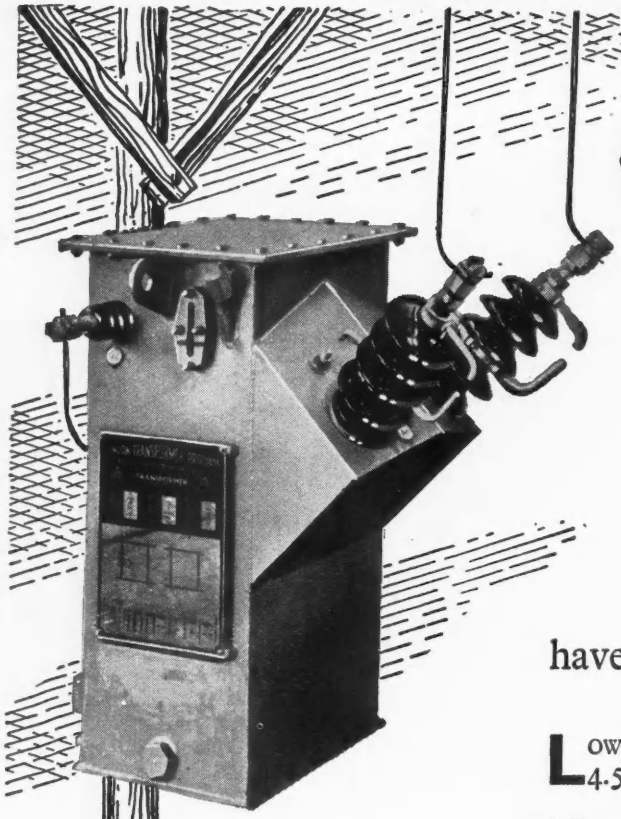

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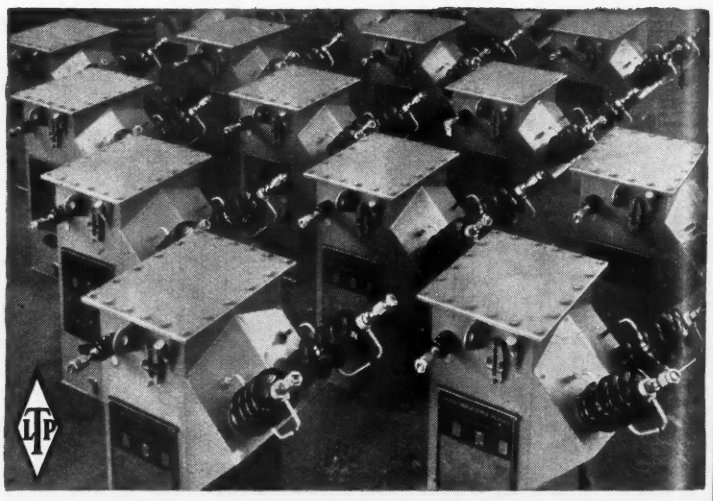

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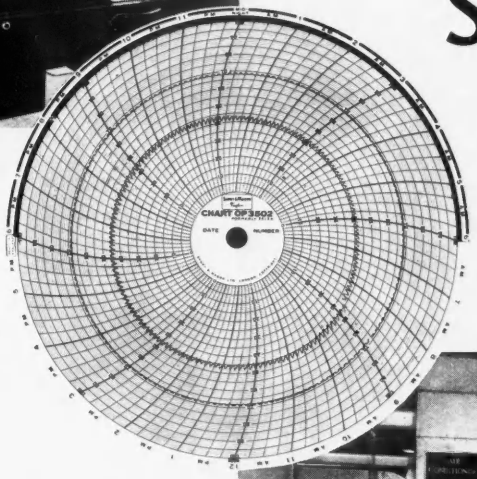
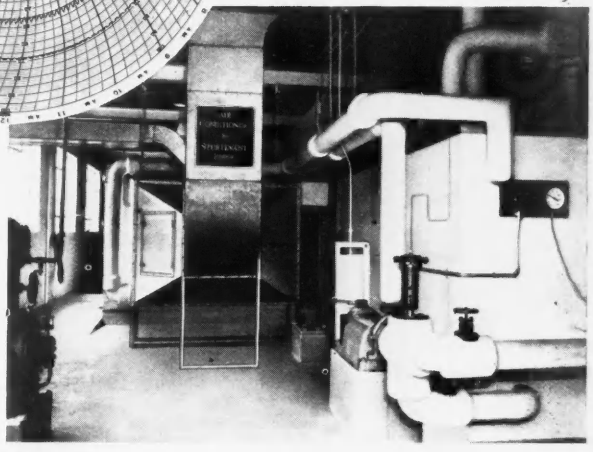


Constant Temperature Plant



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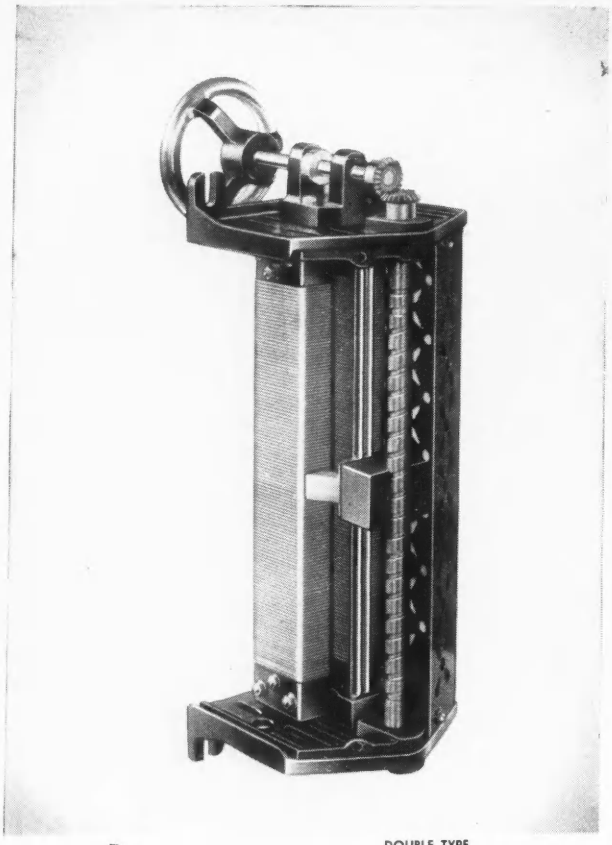

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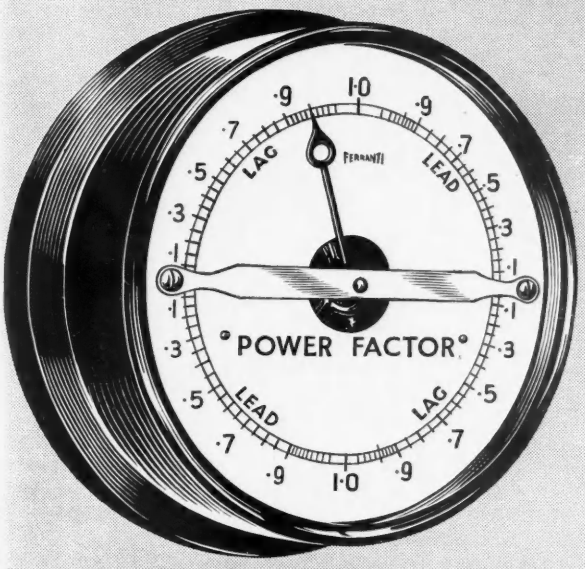
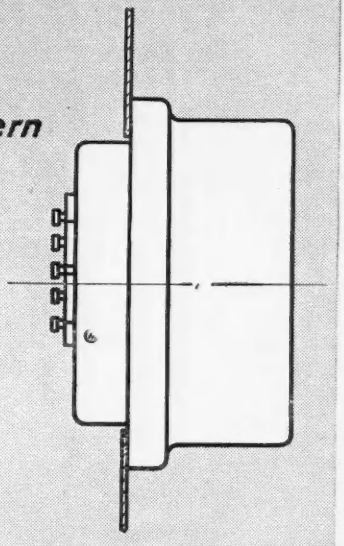


Round Pattern



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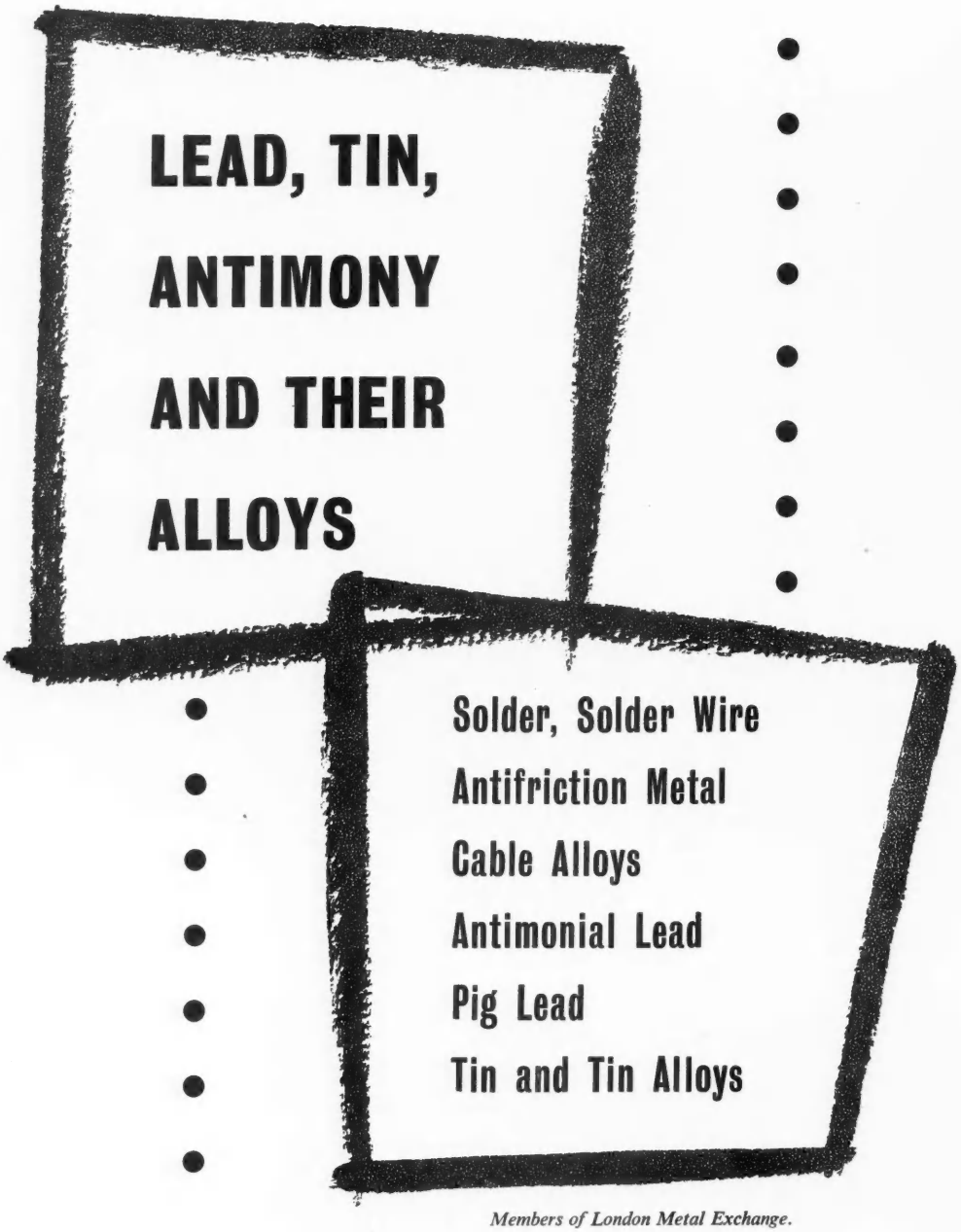

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(Illustration) close-up view of paper lapping machine.

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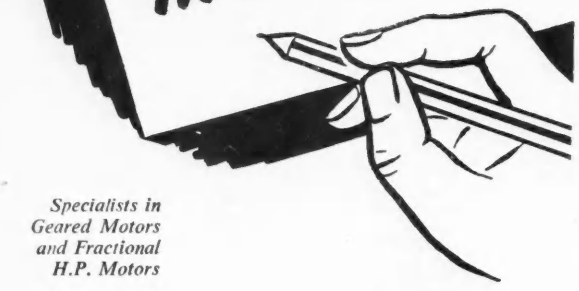

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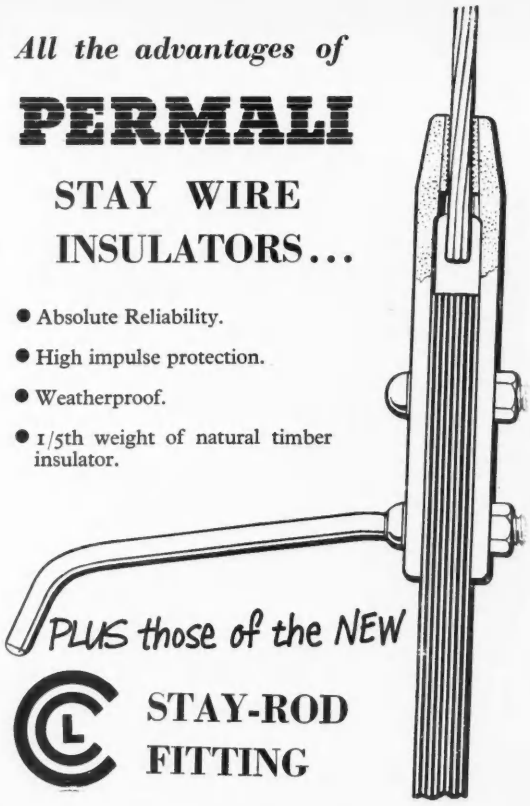

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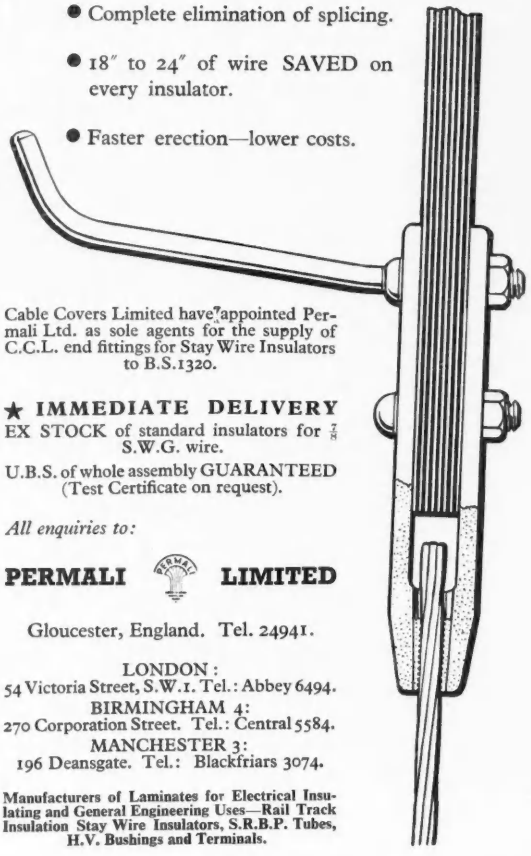

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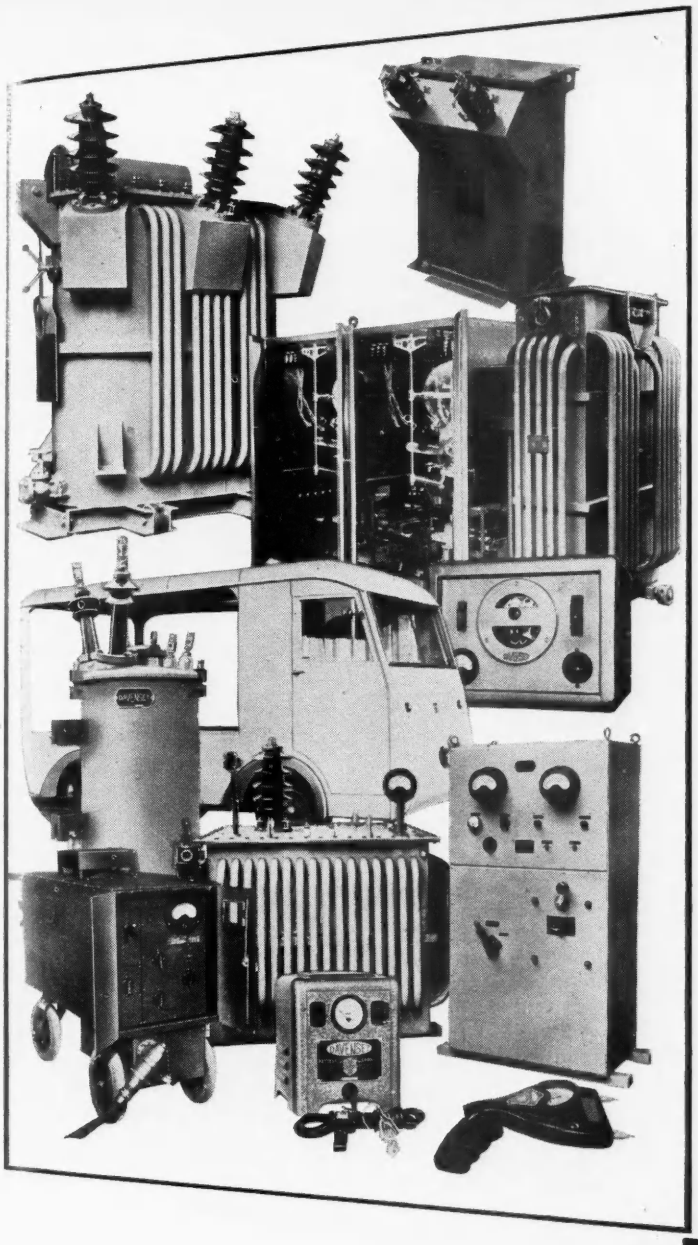

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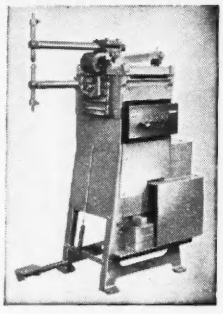

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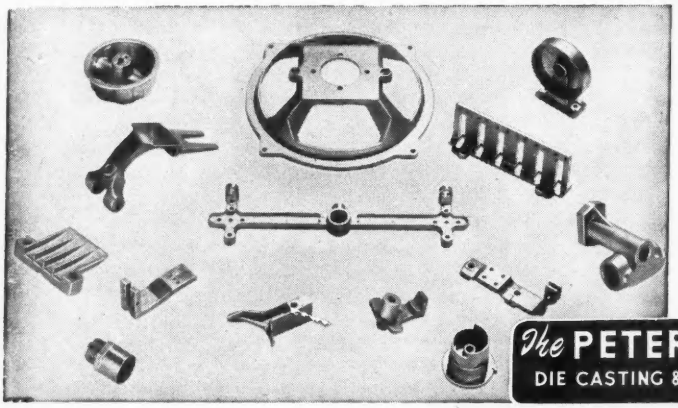

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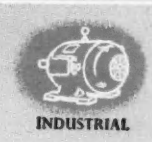
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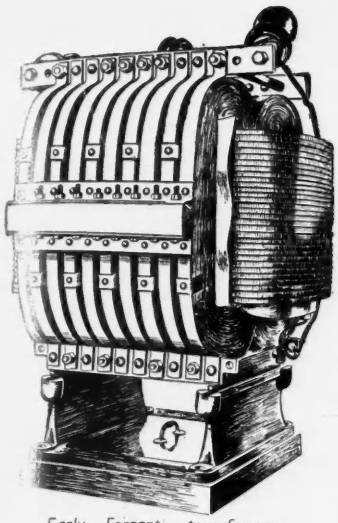

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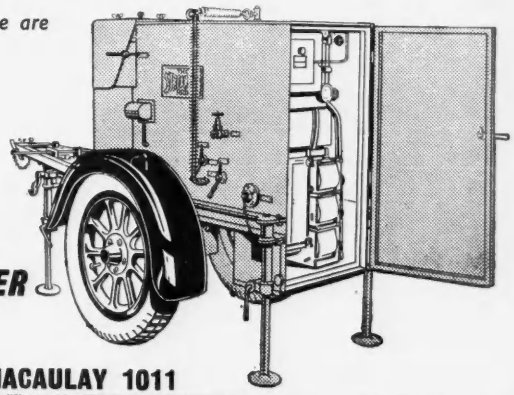

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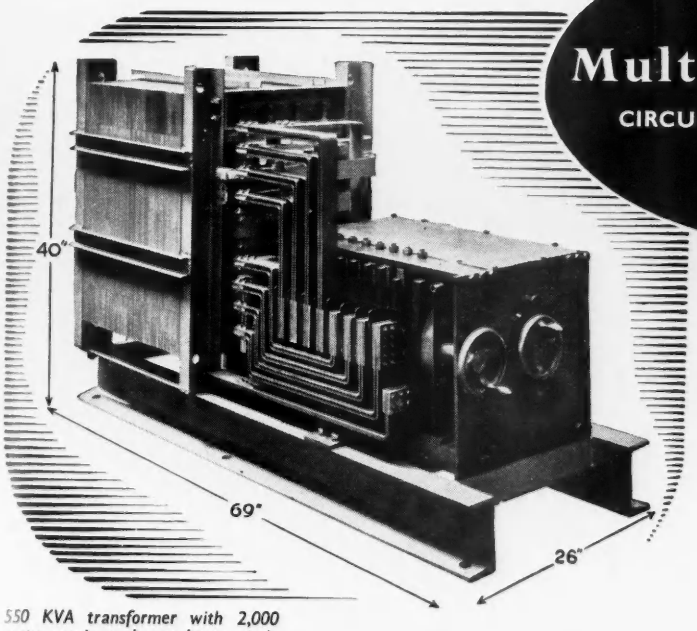

550 KVA transformer with 2,000 amps. continuously rated tap switch.

Medium voltages cont. rated 500—6,000 amps. Handwheel operation and tap position indicator. High mechanical contact pressure — no springs employed. Overall dimensions of 440 volt, 750 amps., 8 tap unit: 18″ × 18″ × 13¾″ deep.

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Fig. 396 "UNDERDOME" BELL
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Fig. 398 "ALL-IN-ONE" BELL
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Fig. 382 "TWO-IN-ONE" BELL
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Fig. 391 BAKELITE CASED BELL
Conventional Bell for battery or transformer working as ordered. Can be supplied with Dome, Church or Sheep Gong.
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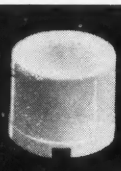

Fig. 384
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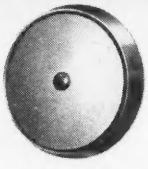

Fig. 1079
SURFACE DIS-CO-BELL
A 7" resonant disc gong. Gives a distinctive note. Small projection, bronze finish. Flat battery inside or transformer working.
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Fig. 1132 TRANSFORMER
Air-cooled single phase transformer. Case tapped ¾" conduit entry. Fused secondary. Primary and secondary windings to suit requirements. Output up to 200 VA. Prices on application.

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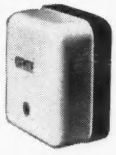

Fig. 1139 TRANSFORMER*
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Fig. 1065 UNDERDOME BELL
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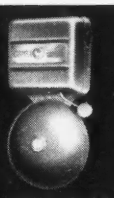

Fig. 145 METALCLAD BELL
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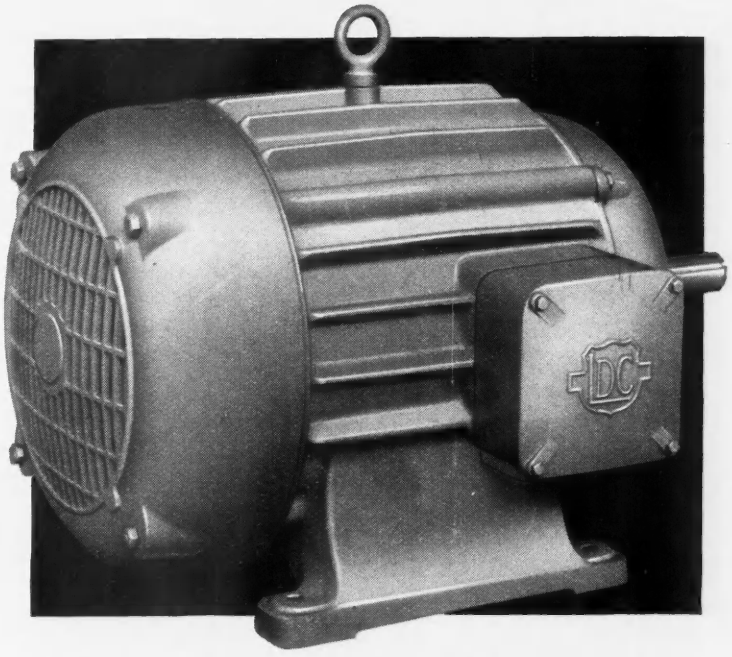

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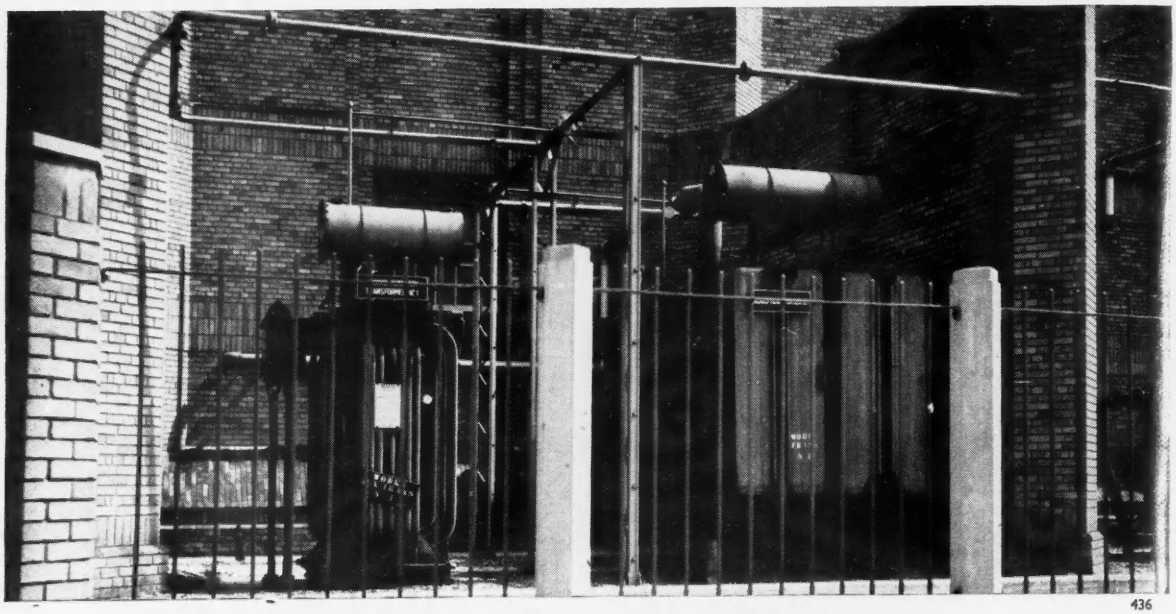

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TRANSFORMER PROTECTION by Mulsifyre

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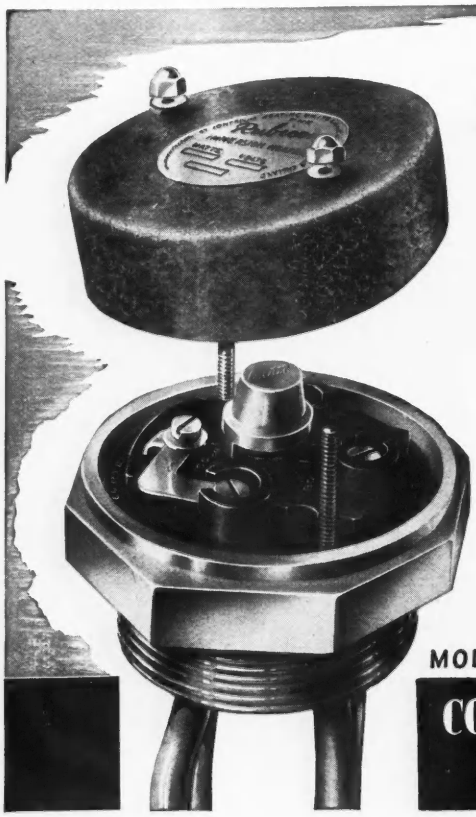

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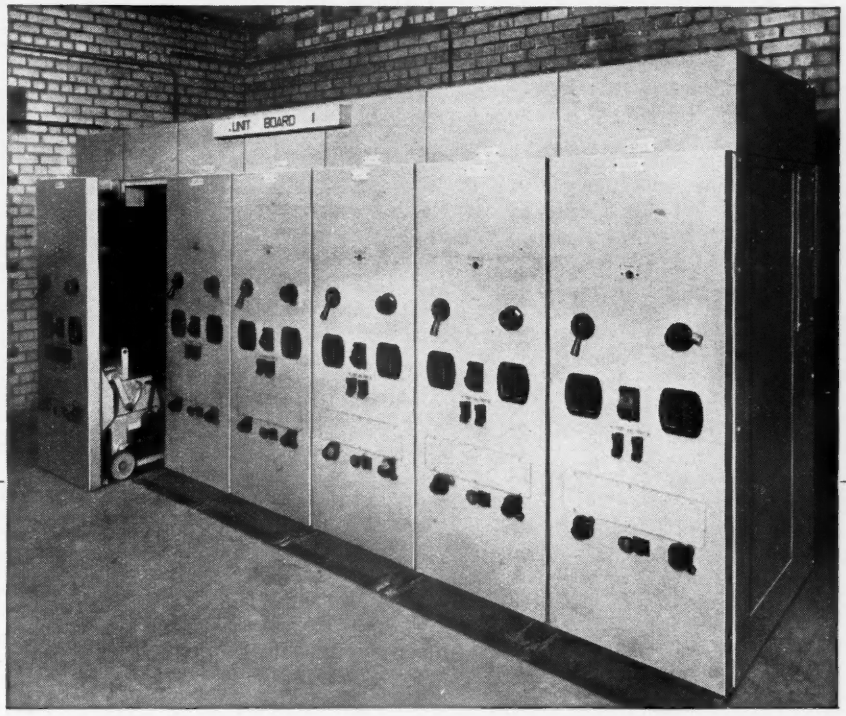

The 'ENGLISH ELECTRIC' Company installed the main auxiliary switchgear comprising 29 type OB.33L 3,300 volt, 36 type OB.2 and 5 type OB.3 415 volt air-break circuit breakers at the Bold Power Station of the British Electricity Authority.

The illustration shows a 7-panel 3,300 volt, single-busbar switchboard similar to the equipment installed which comprises type OB.33L air circuit breakers having a breaking capacity of 150 MVA and current ratings up to 2,000 amps.

The 415 volt switchgear consists of 10 single-busbar switchboards comprising 600 amp type OB.2 air circuit breaker units having a breaking capacity of 15 MVA at 400 volts and type OB.3 air circuit breaker units having a breaking capacity of 25 MVA at 400 volts and current ratings up to 1,600 amps.

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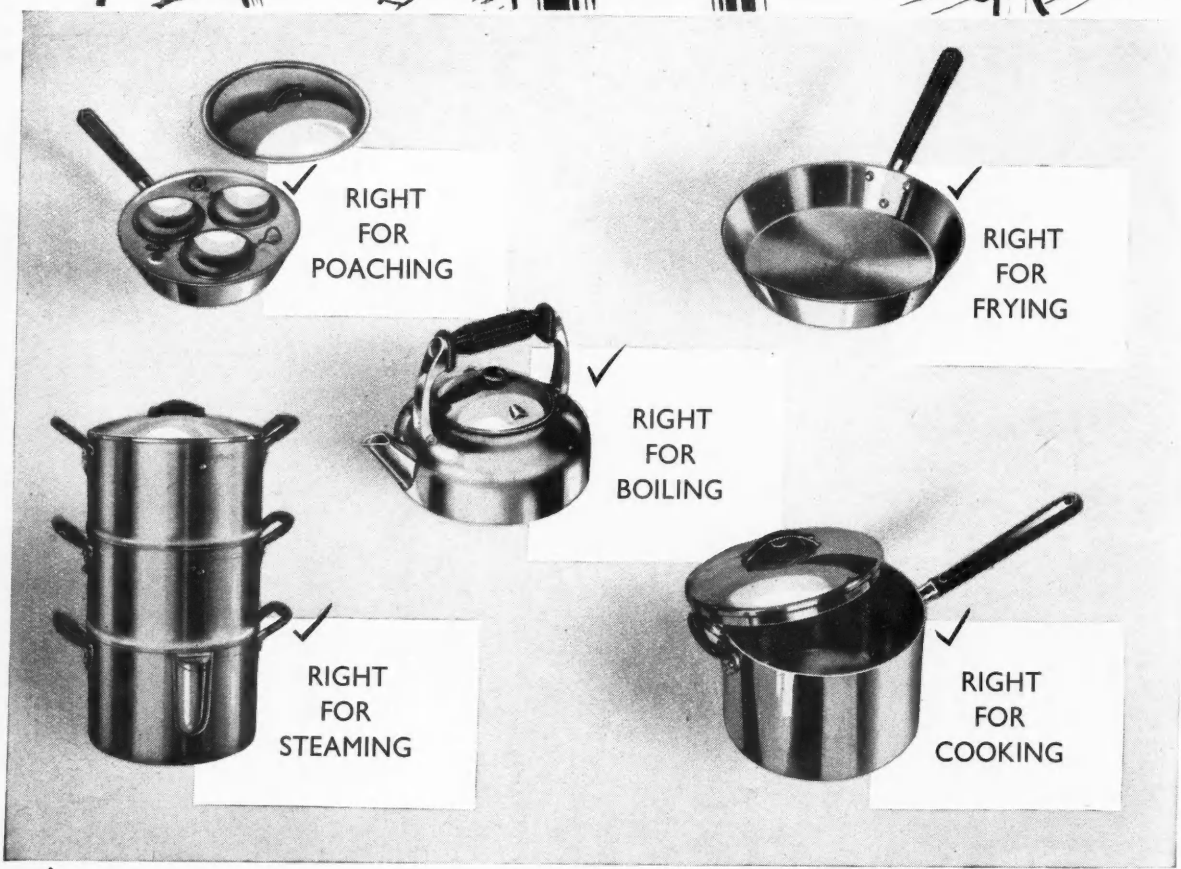

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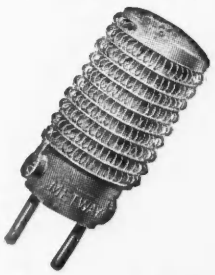

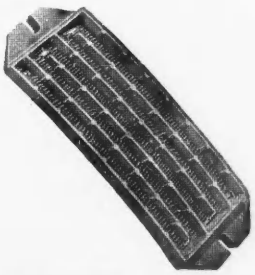

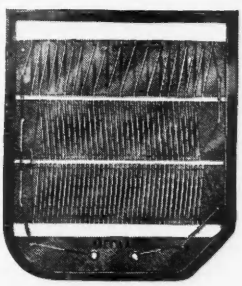

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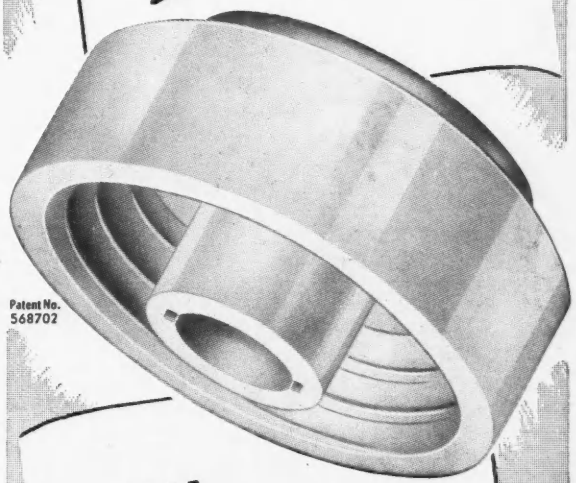

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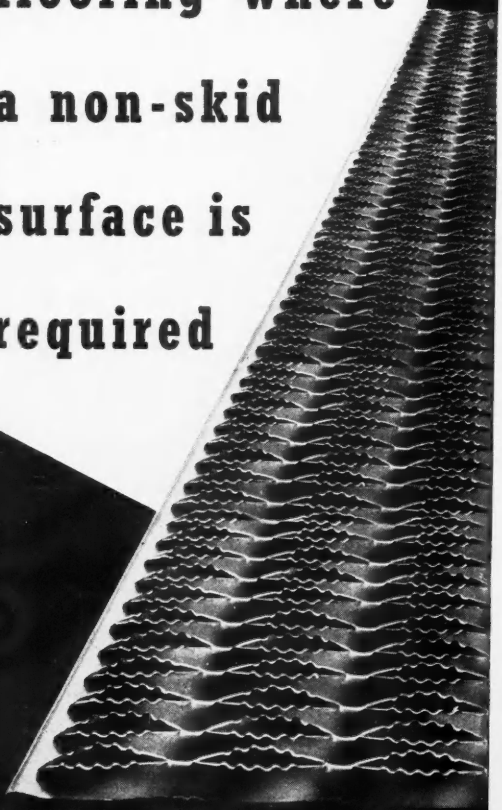

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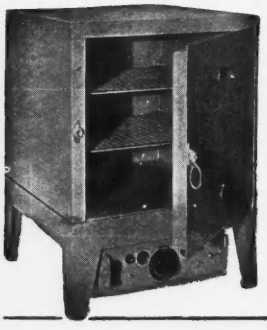

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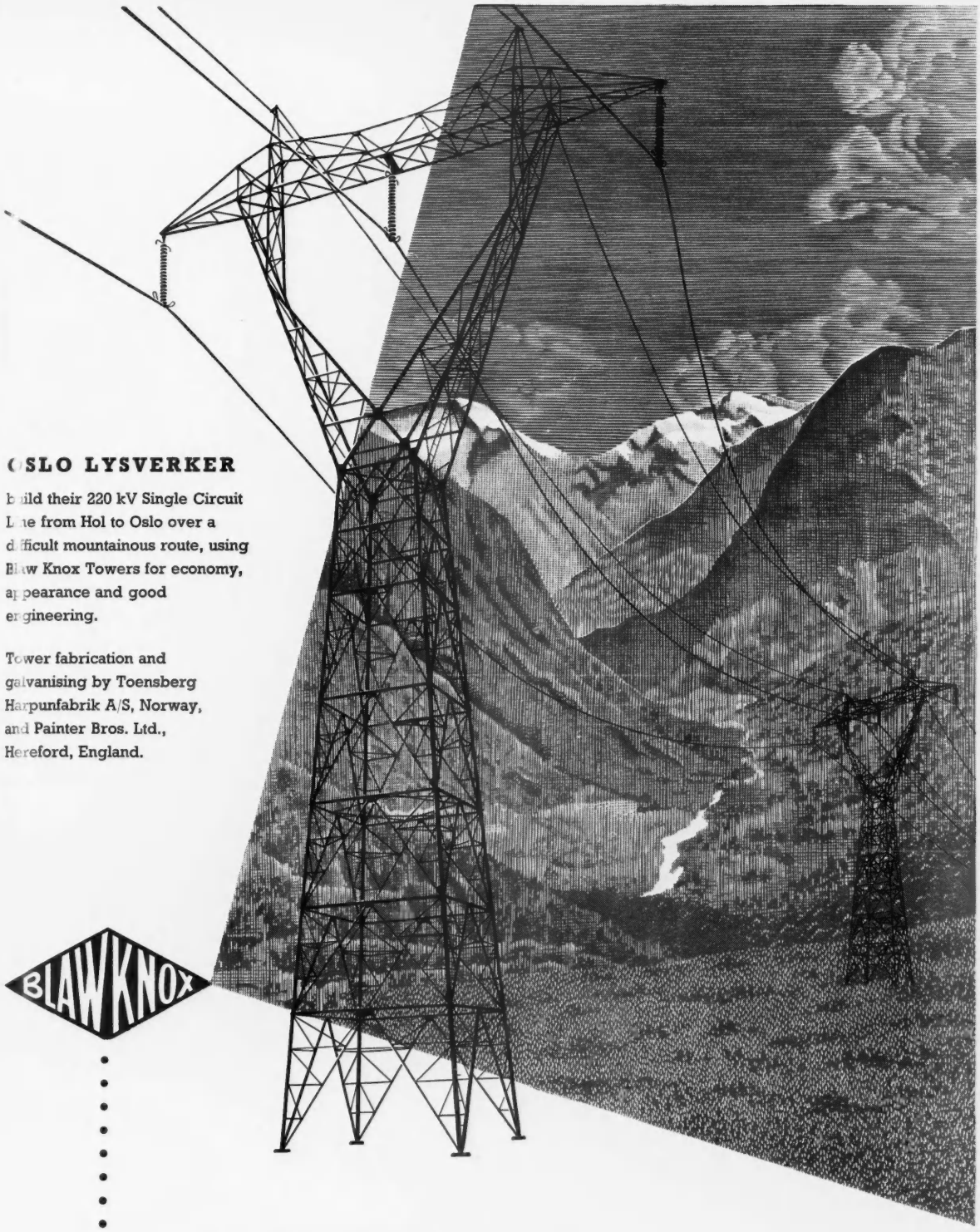

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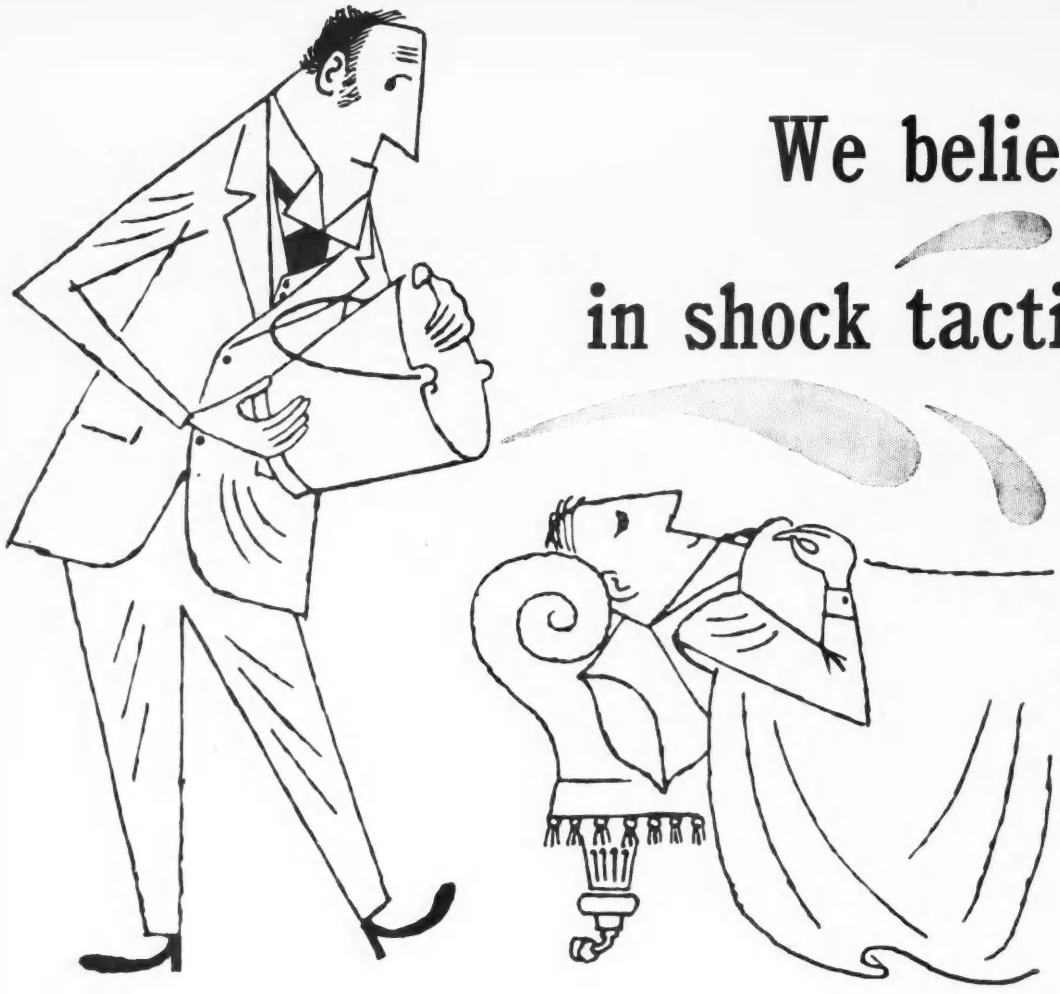

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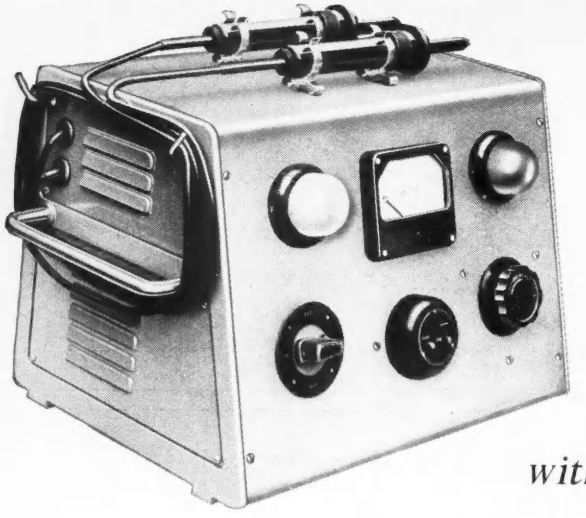

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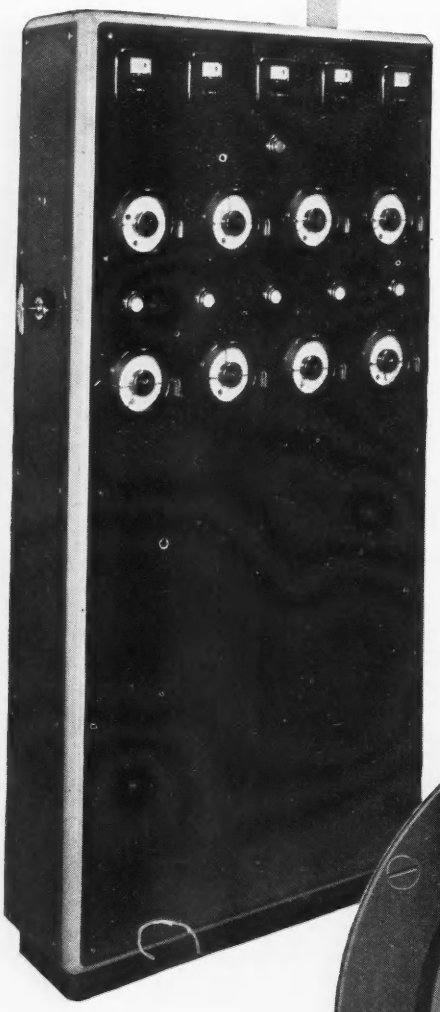

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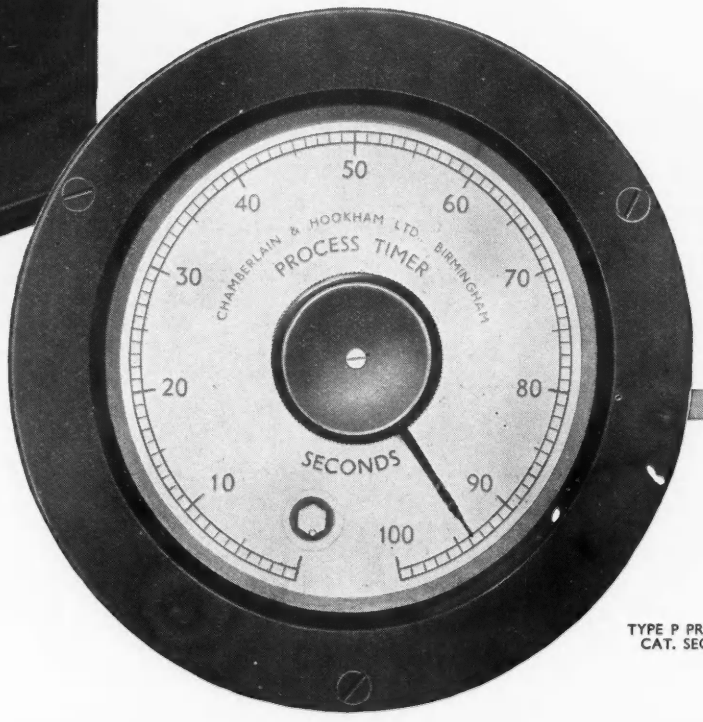

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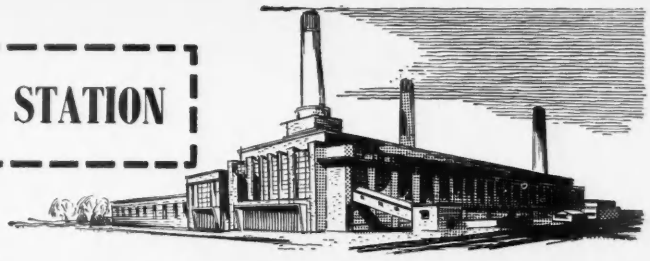

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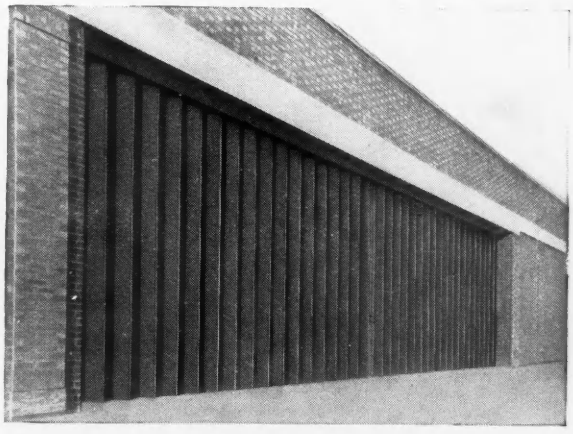

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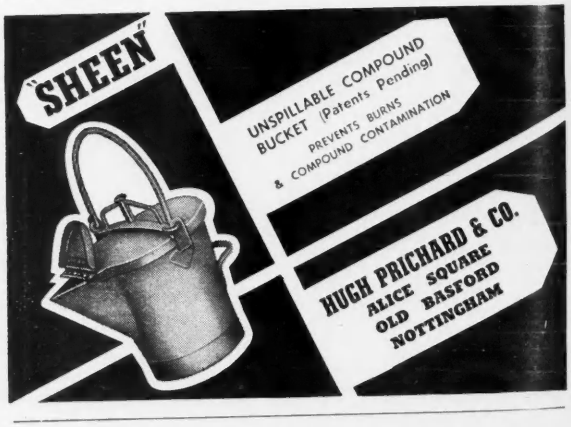

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for Electrolytic Processing

Brentford Voltage Regulators installed by the Westinghouse Brake and Signal Co. Ltd. in the new Electrolytic Plant of the Glamorgan Alkali and Acid Co. Ltd., Pontypridd, S. Wales.

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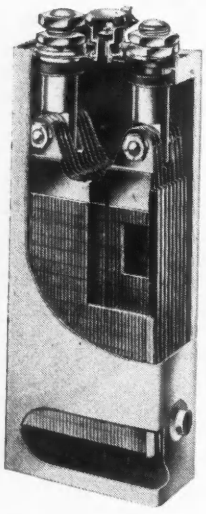

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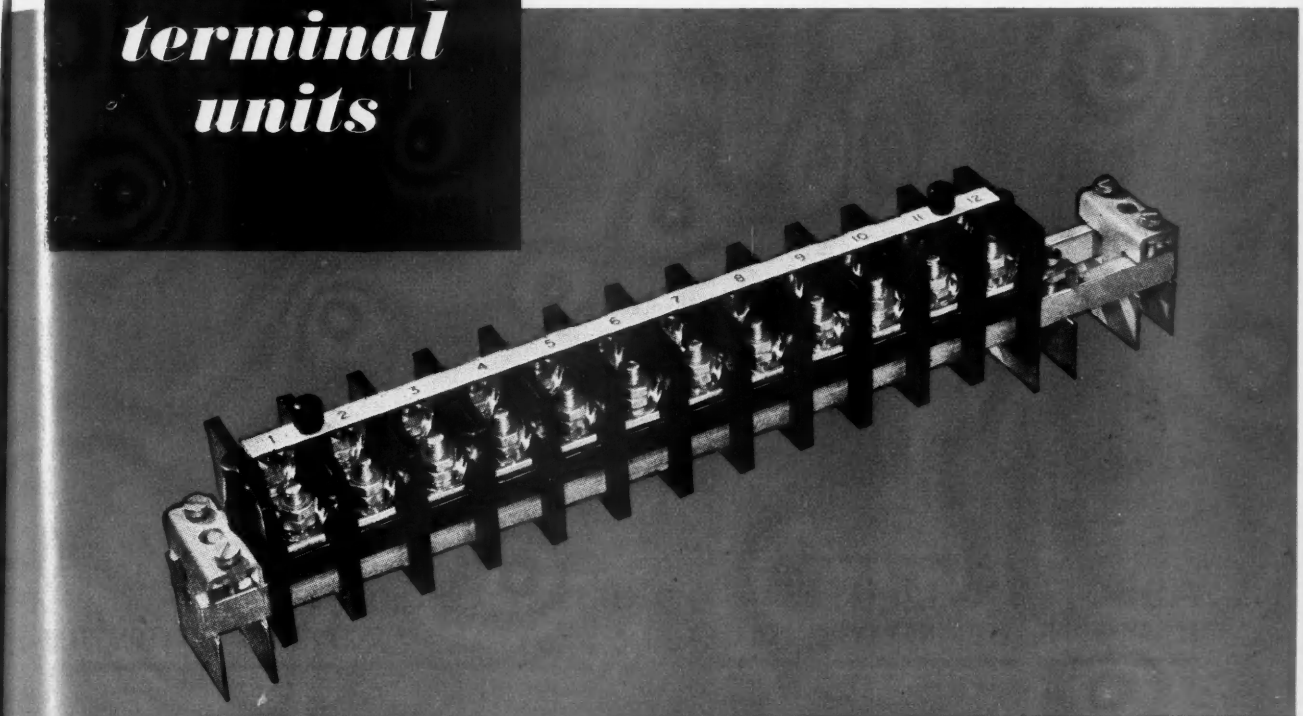
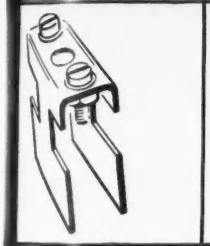
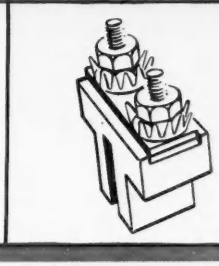
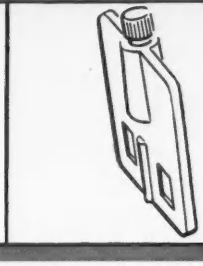
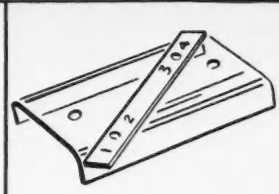
ASTRAL *multiway terminal units*

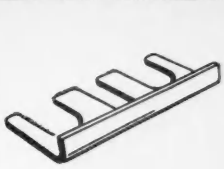












APPLICATIONS Cable terminations, interconnections and testing. L.T. systems, switchboards, control equipment, traction, etc.

DESIGN Any number of terminal ways, built from eight basic types of interlocking components. No live metal underneath, and room to pass cables under. Framework earths. Optional, bridging links, two, three or more ways. Supplied assembled and complete, or in parts to order.

MATERIALS Terminal pillars on solid plates, all nickelled brass, each pair on heavy moulded black phenolic segments, with separate barriers, all locking into position. Cadmium plated steel support bars, brackets and screws. Optional, nickelled copper bridging links.

DIMENSIONS Overall height $3\frac{3}{4}''$, width $2''$. Length, two-way $5\frac{15}{32}''$ increasing $\frac{29}{32}''$ for each additional terminal way, example, twelve-way $14\frac{17}{32}''$. Two $\frac{7}{32}''$ fixing holes at centres $\frac{7}{8}''$ less than overall length. Steel support bars $\frac{1}{2}''$ x $\frac{3}{4}''$.

TERMINALS Rating 60A. 660V. Each separate segment has two No. 0 B.A. Pillars, with lock nuts and claw terminals, or cable sockets if specified. Each interlocking segment can be separately removed, for easy connecting.

SHIELD & LABEL Optional. Both separately detachable, secured by insulated screwed knobs. Rigid transparent P.V.C. shield. Ivorine label supplied blank, or numbered lettered per terminal way to order.

INSTALLATION Units up to twenty-four ways, fixed with two No. 0 B.A. cadmium plated screws and nuts, supplied. Behind switchboards, on equipment panels, or mounted in Astral Adaptable or other boxes, cubicles, etc., as desired.

Astral adaptable boxes too

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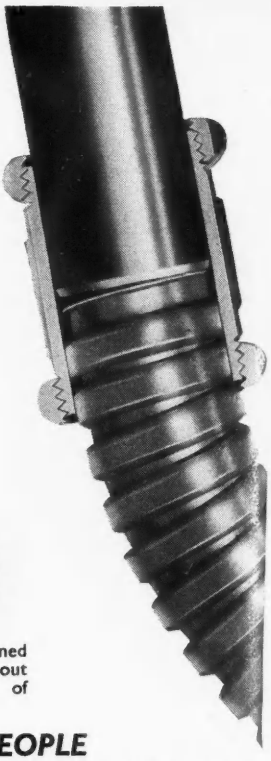
ABCON conduit coupling

(Approved by the London Electricity Board)

Just slide on the Abcon fitting, tighten up, and the joint is made.

The greatest advance in conduit technique for years. The new ABCON conduit coupling is one of the most important advances that this field of electrical work has seen for many years.

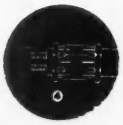
HOW IT WORKS. Tightening of the taper-threaded nut tightly contracts the slotted end of the ABCON fitting to the conduit.



For joining rigid to flexible conduit (of same outside diameter of rigid conduit).

For joining rigid to rigid (no screwing of conduit required)

Supersedes inspection elbows. Sound bonding.



Joints may be opened at any point without dismantling run of conduit.

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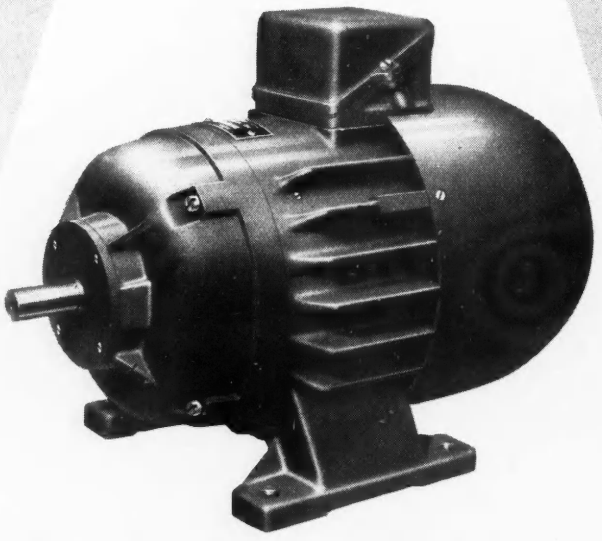
Two Speed Synchronous Hysteresis

We will be glad to furnish details on request.



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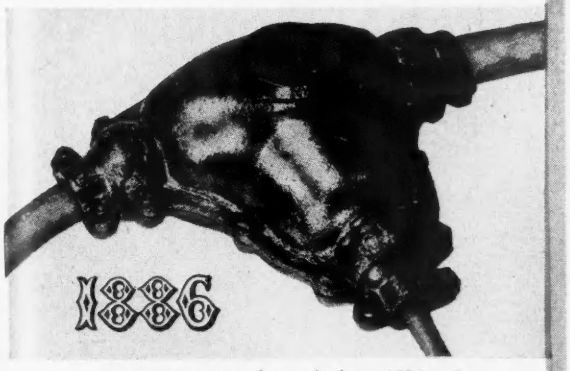
We were pioneers in the design and development of joint boxes for all types of electric cable. Some of the boxes from our present range for medium-voltage work are shown on the right.

A catalogue of medium-voltage joint boxes is available on request. Please ask for Publication No. 309.



A cast-iron joint box of about 1886. *Large numbers of these gave completely satisfactory service in early low-voltage networks in London and other principal cities. They were employed in conjunction with the Edison Tubular Main Operating at* 110v *D.C.*

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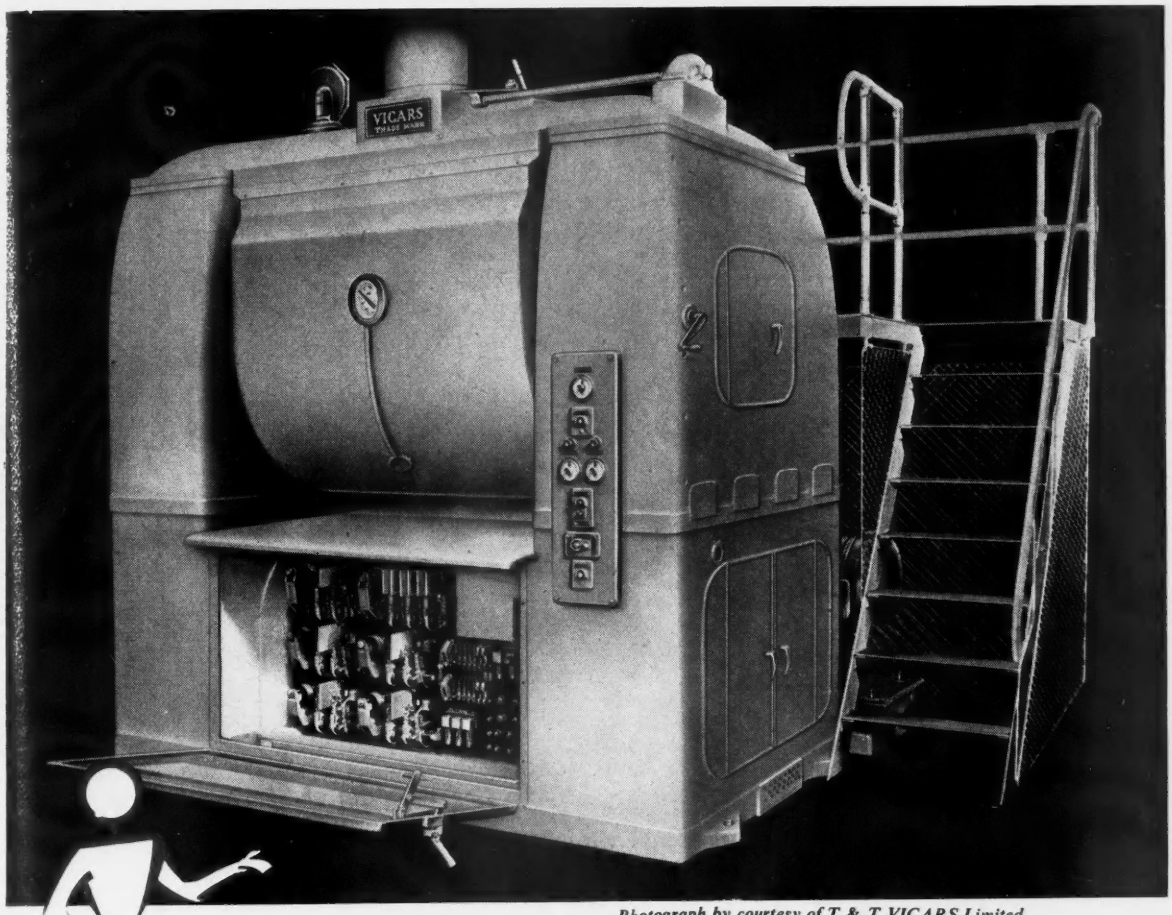

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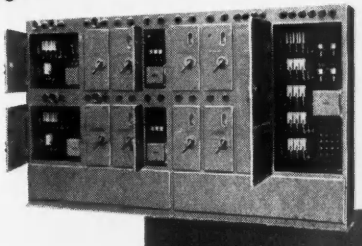
at the touch of a switch— —but whose switch?



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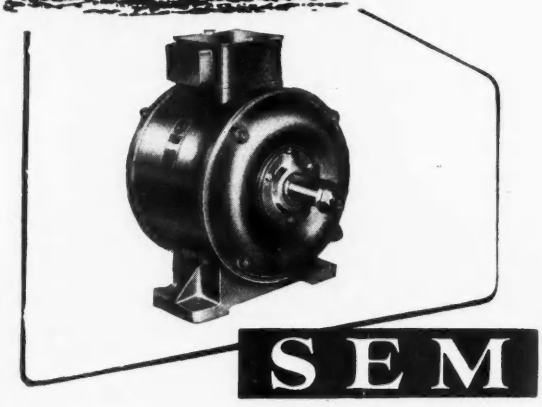

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THE CRABTREE TYPE D-6 HAND-OPERATED MOTOR STARTER

THERE ARE THREE PATTERNS

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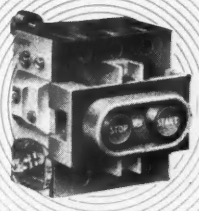
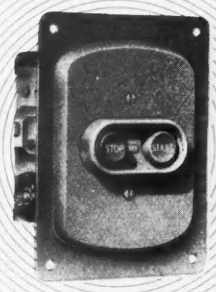
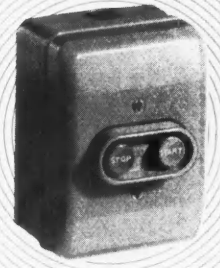


Unit for FLUSH MOUNTING



Unit for SURFACE MOUNTING



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- Ready Adjustment to Motor Current on site
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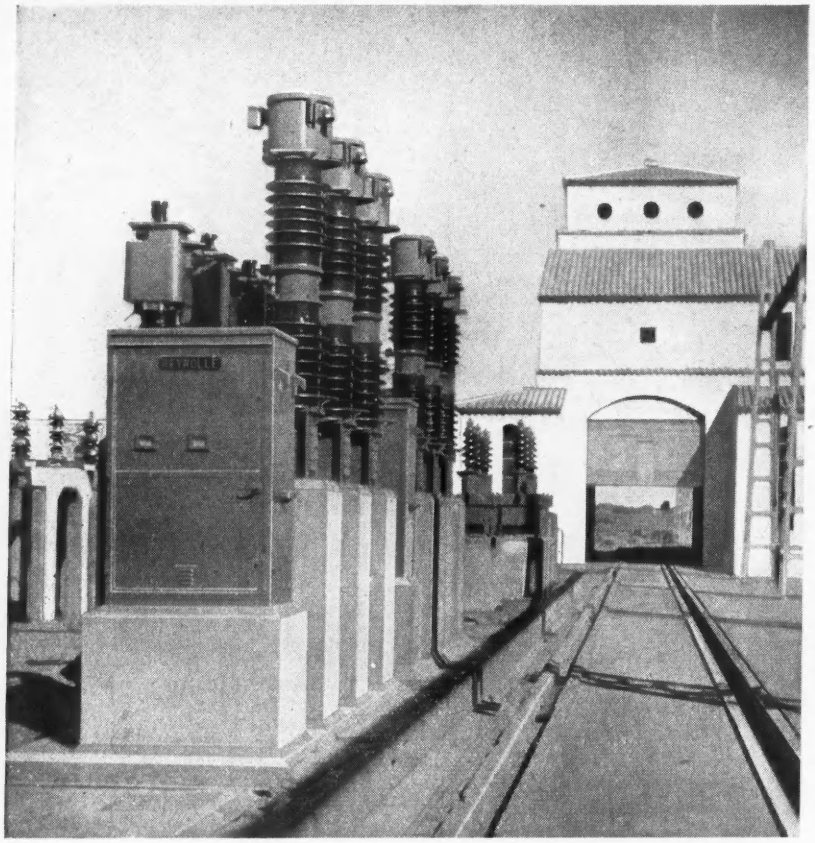

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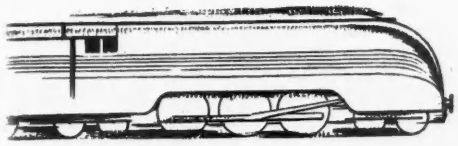

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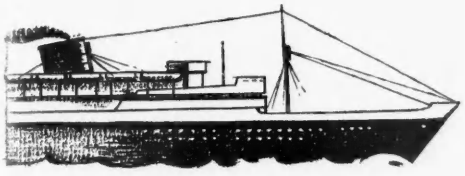
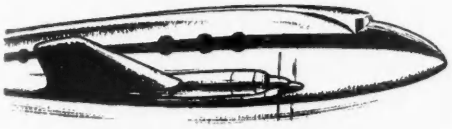


and yet more



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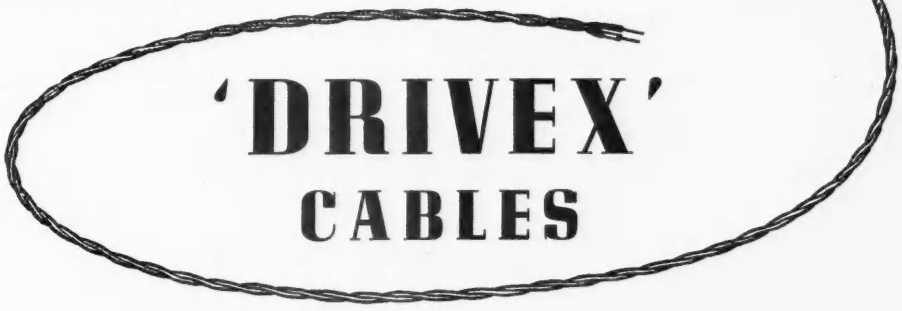

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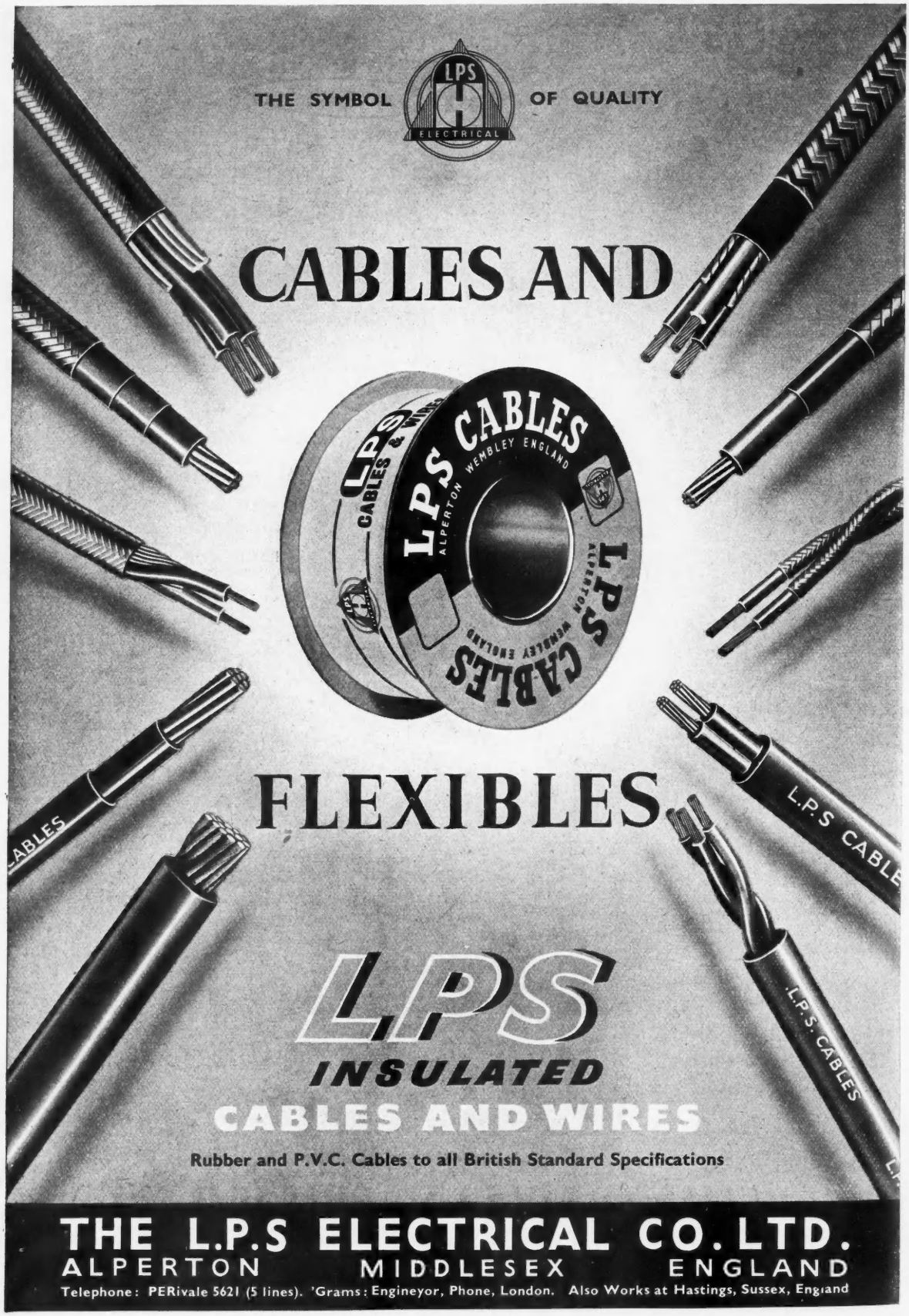
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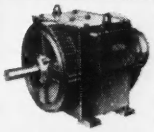
Compared with the orthodox alternator with overhung exciter

In	price	weight	volume	c.i.f.charges
the	BRUSH		Square	Path
Alternator	saves	you	about	20%

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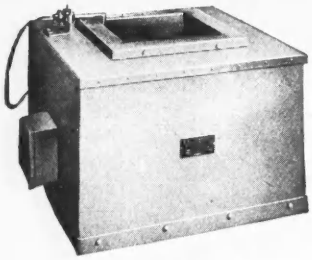

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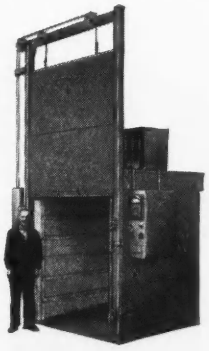

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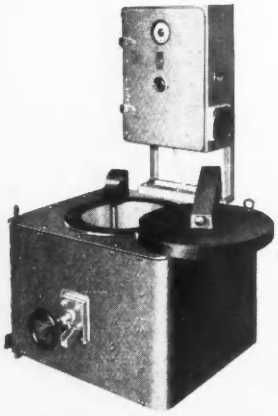

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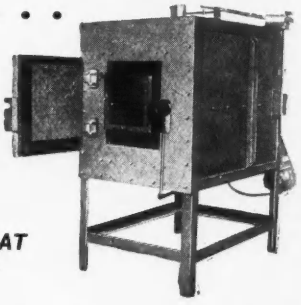

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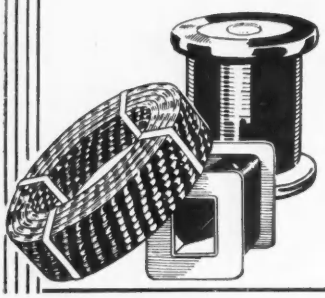

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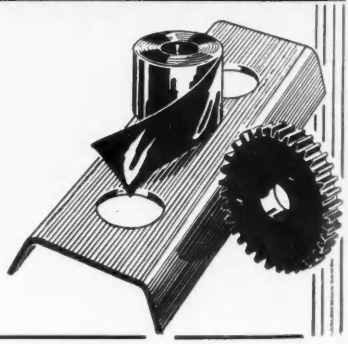

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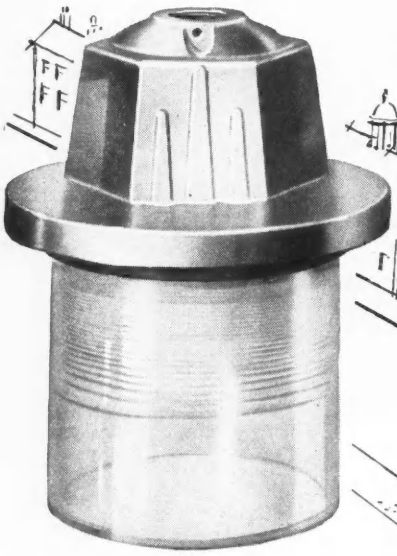

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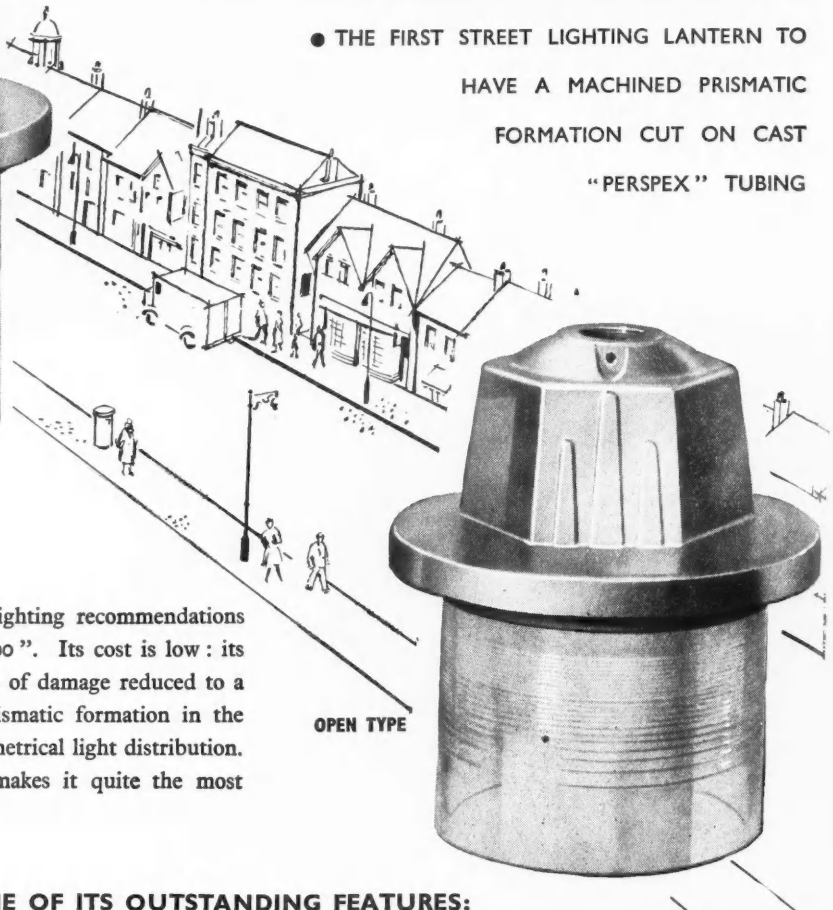

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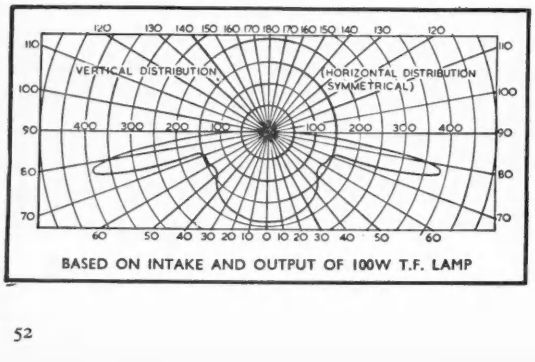

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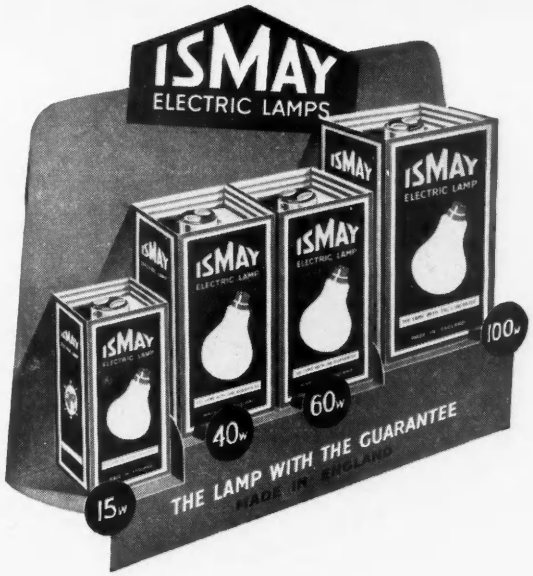

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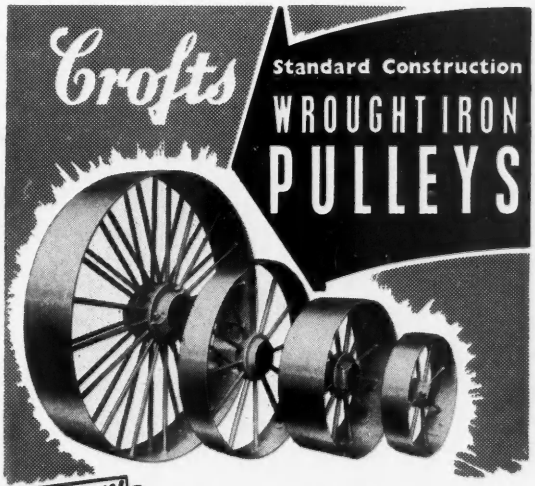

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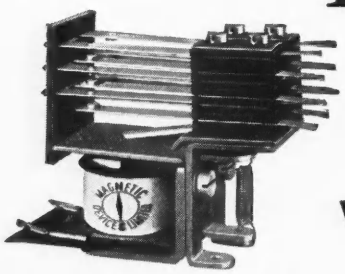

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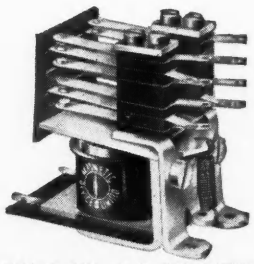

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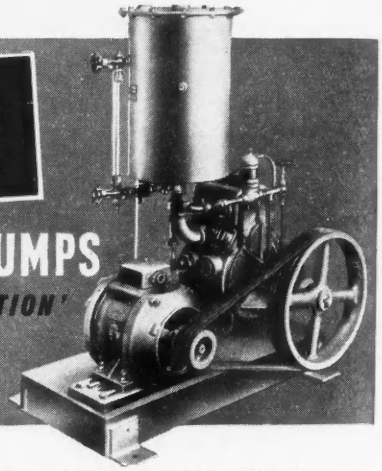

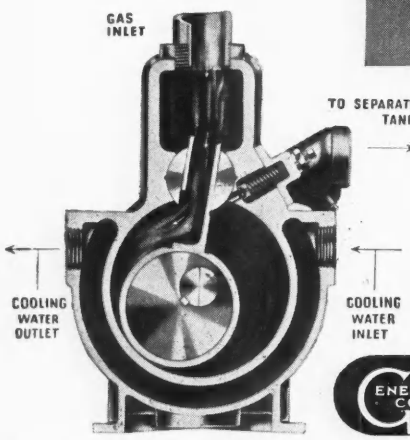

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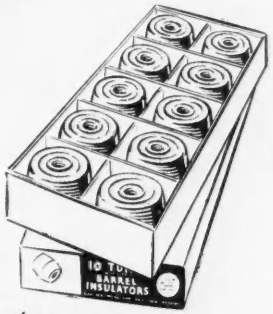

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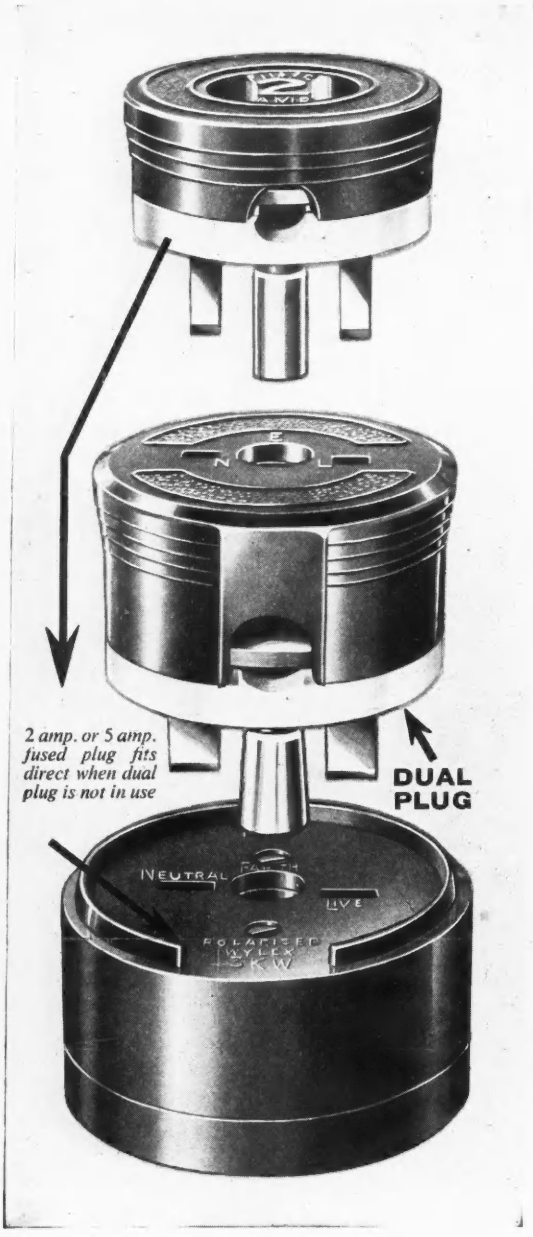

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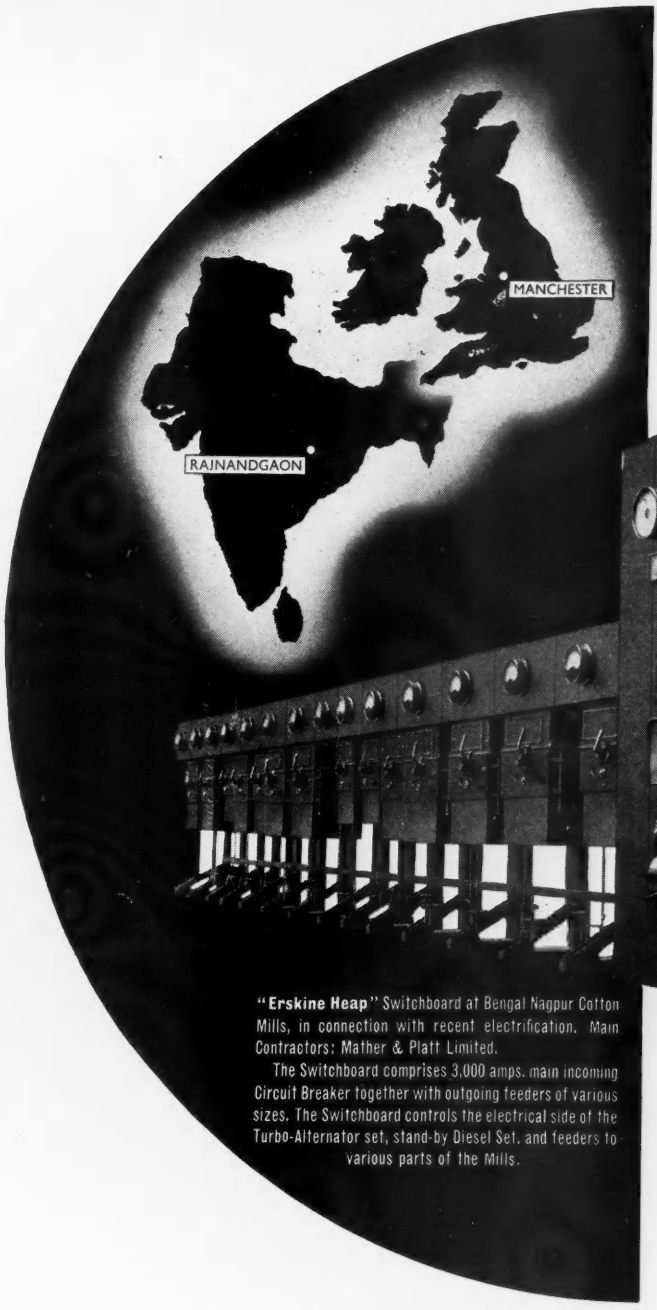
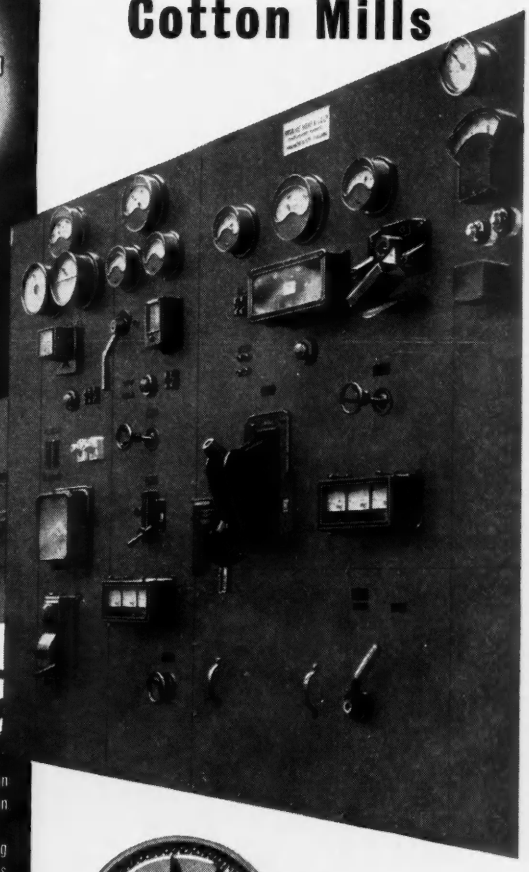
"Erskine Heap" SWITCHGEAR at BENGAL NAGPUR Cotton Mills





"Erskine Heap" Switchboard at Bengal Nagpur Cotton Mills, in connection with recent electrification. Main Contractors: Mather & Platt Limited.

The Switchboard comprises 3,000 amps. main incoming Circuit Breaker together with outgoing feeders of various sizes. The Switchboard controls the electrical side of the Turbo-Alternator set, stand-by Diesel Set, and feeders to various parts of the Mills.

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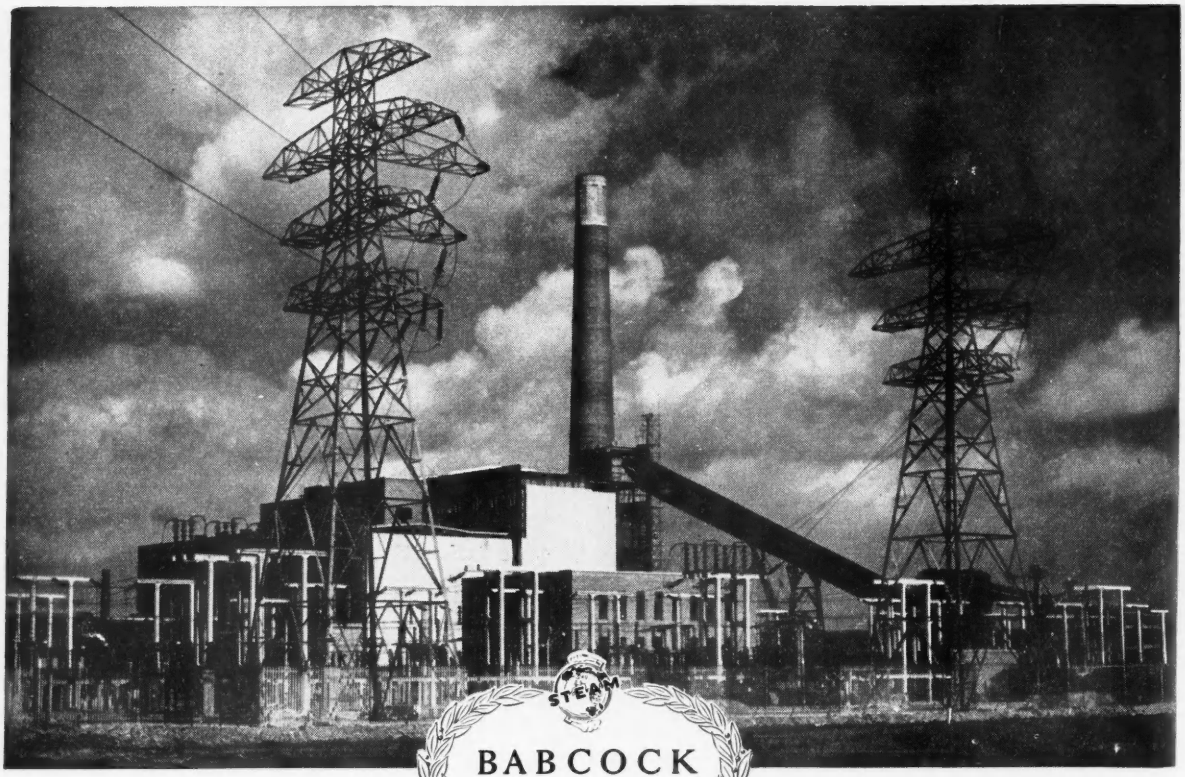

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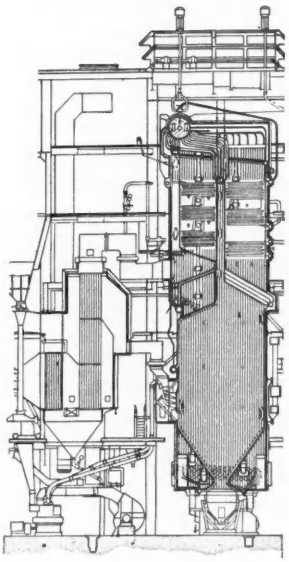
B.E.A. NORTH WESTERN DIVISION

The Babcock boilers at the new 240 MW. Carrington power station are Radiant units, each with an evaporation of 360,000 lb./hr. at 940 lb./sq. in. and 920°F., and fired with pulverized coal by means of eight horizontal intertube burners.

The contract includes all the coal pulverizing plant, comprising 28 Babcock type E mills to feed seven boilers.



Ash, collected in the 'A' type water-filled hoppers is discharged to sump by the "*Hydrojet*" system, being pumped to settling ponds by "*Hydroseal*" ash pumps. Dust is extracted from the precipitator and air-heater hoppers by the "*Hydrovac*" system. All this is Babcock equipment, widely used in both power station and industrial installations.

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Managing Editor: HUGH S. POCOCK, M.I.E.E.
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20 AUGUST 1954

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VOLUME 155 ✧ NUMBER 8

Eighty-Second Year of Publication

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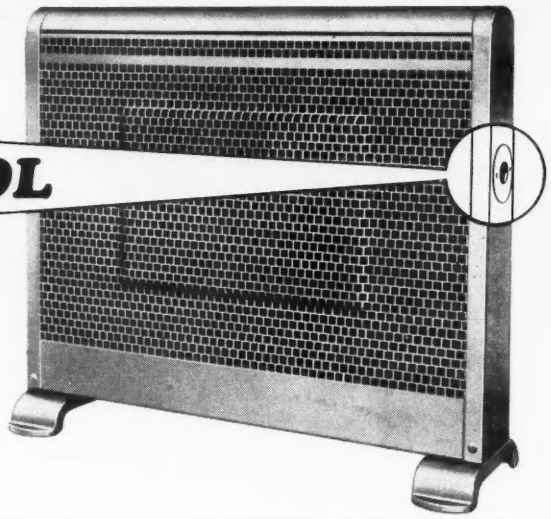
VARIABLE CONTROL

RAYDAIR Heater



The Raydair Heater, which has proved itself in many thousands of homes, has been modified for the coming season by the introduction of a variable thermostat. By moving the recessed control to "High" or "Low", a wide variation of heat output can be achieved to suit individual requirements.

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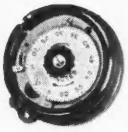

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ELECTRICAL REVIEW

20 August 1954 Vol. 155 No. 8 Established 1872

Wages, Profits and Production

THE last claim for an increase of wages by those employed in the engineering industry was for 15 per cent. After abortive negotiations between the Engineering and Allied Employers' National Federation and the Confederation of Shipbuilding and Engineering Unions the dispute was submitted to a Court of Inquiry (together with a similar case for shipbuilding workers). The Court made an exhaustive investigation of the circumstances and made several recommendations. The immediately applicable one was that the parties should meet again with a view to agreeing to some increase—possibly about a third of the amount claimed. Subsequently this meeting was arranged and a 6 per cent increase was conceded.

The Court did not believe that the sort of increase justified in this particular claim would be " disastrous " by itself, but it pointed out that the claim was part of a more general movement of wages, costs and prices. Nevertheless a continuation of pressure for higher wages was expected and this was the main theme at last week's annual meeting of the Confederation.

Mr. H. G. Brotherton, the president, devoted much of his address to the subject. He contended that, despite their gloomy forecasts at the inquiry, engineering concerns were making high profits and could afford to improve their workers' conditions quite apart from cost-of-living considerations. The only question was when and in what form a new claim should be made.

The profit-sharing suggestion implicit in Mr. Brotherton's remarks sounds reasonable. It is unfortunately the case, however, that while under such a scheme an upward movement of wages would be easily accomplished a reversal in any subsequent slump period would lead to industrial trouble.

It is true that many concerns, after the period of dividend limitation, have increased their dividends, but it should not be assumed that this will continue. Many influences which have operated in favour of engineering concerns are unlikely to persist and so-called " gloomy forecasts " may be justified.

At the same time engineering wages should be commensurate with the importance of the industry to the country and, particularly, rates for skilled men must be sufficient to encourage recruits. There is an urgent need for an examination of the industry's wages structure which will probably disclose that rewards to the workers are very unevenly distributed. In the meantime, however, the Confederation has resolved to ask for a " substantial increase " in wages—a term, we remember, which the Electrical Trades Union used in making its last demand.

STEELS FOR STEAM PLANT

In view of recent developments it is obvious that electricity generated by steam power from nuclear fission is the pattern of the future and the continuing predominance of the steam turbine is practically assured. In the early days turbine components were made from carbon steels, but as the operating conditions became more severe alloy steels having higher resistance to stress for prolonged periods at elevated temperatures had to be developed. First 0·5 per cent molybdenum steels and then 0·5 per cent molybdenum 1 per cent chromium steels were adopted for superheater tubes and steam pipes, 0·5 per cent molybdenum 0.25 per cent vanadium steels being used for turbine rotors and for cast turbine casings. These grades of steels must be used not only to withstand arduous duties but to withstand them for two or three decades continuously without any risk of failure. Research must always seek to improve on present standards, to keep ahead of or at least up with the demands of the engineer. Already plant is being constructed to operate at temperatures of 1,050 deg F and pressures of 1,500 lb/sq in and in such cases new problems of sealing and corrosion become acute. Some plant of this description is to come into operation this year.

THERMIONIC VALVE JUBILEE

On 16th November next it will be exactly fifty years since Sir Ambrose Fleming applied for a British patent for his thermionic valve. Since then great strides have been made in its development and it has had a profound effect on civilization because it has made so many things possible: radio, television, radar, high speed automatic computation and the electronic control of machines and industrial processes. The Council of the Institution of Electrical Engineers has arranged for this jubilee of the thermionic valve to be celebrated in London on 16th November when the proceedings will be opened by the Lord President of the Council, the Marquess of Salisbury. Three lectures will be delivered, one each by Sir Edward Appleton, Prof. G. W. O. Howe and Dr. J. Thomson, dealing with valves from the earliest developments to the present day. An exhibition of relevant historical apparatus will also be held at the Institution.

COOKER MAINTENANCE

There appears to have been a good deal of trouble with cooker boiling plates in Abertillery. It was reported at a recent Council meeting that the percentage of cooker repairs in Abertillery Council houses was 72 per cent, as against 31 per cent in an area of comparable size. We are not sure that area size is a factor, but the figure is certainly too high. The district commercial manager said that there had been difficulty in getting the tenants of the houses to use correct utensils on the boiling plates, but he also suggested that he should be allowed to investigate and report whether the cookers should be modified or changed. The Council agreed to this. While the use of unsuitable utensils may shorten the life of boiling plate elements, we believe that more damage is done by consumers leaving hotplates running for periods without any utensils on them at all. Enclosed-type plates are the more liable to injury from this cause which is another argument in favour of the open element.

FACTORY TESTS

The elaborate equipment installed by leading electrical manufacturers for testing their products might appear to go a long way beyond what is strictly necessary to comply with customers' specifications. Looking towards the future, however, the large additional cost is seen to be fully justified in furnishing information essential to advances in design. Such tests can make a substantial contribution to applied research. For example, the building of switchgear testing stations a quarter century ago did much more than enable circuit breakers to be correctly rated; they also gave a knowledge of the mechanism of the arc, which has made possible the control of the short-circuit powers of to-day. Similar conditions prevail in the testing of other heavy plant, a notable instance of which is described in this issue.

HIRE-PURCHASE ACT

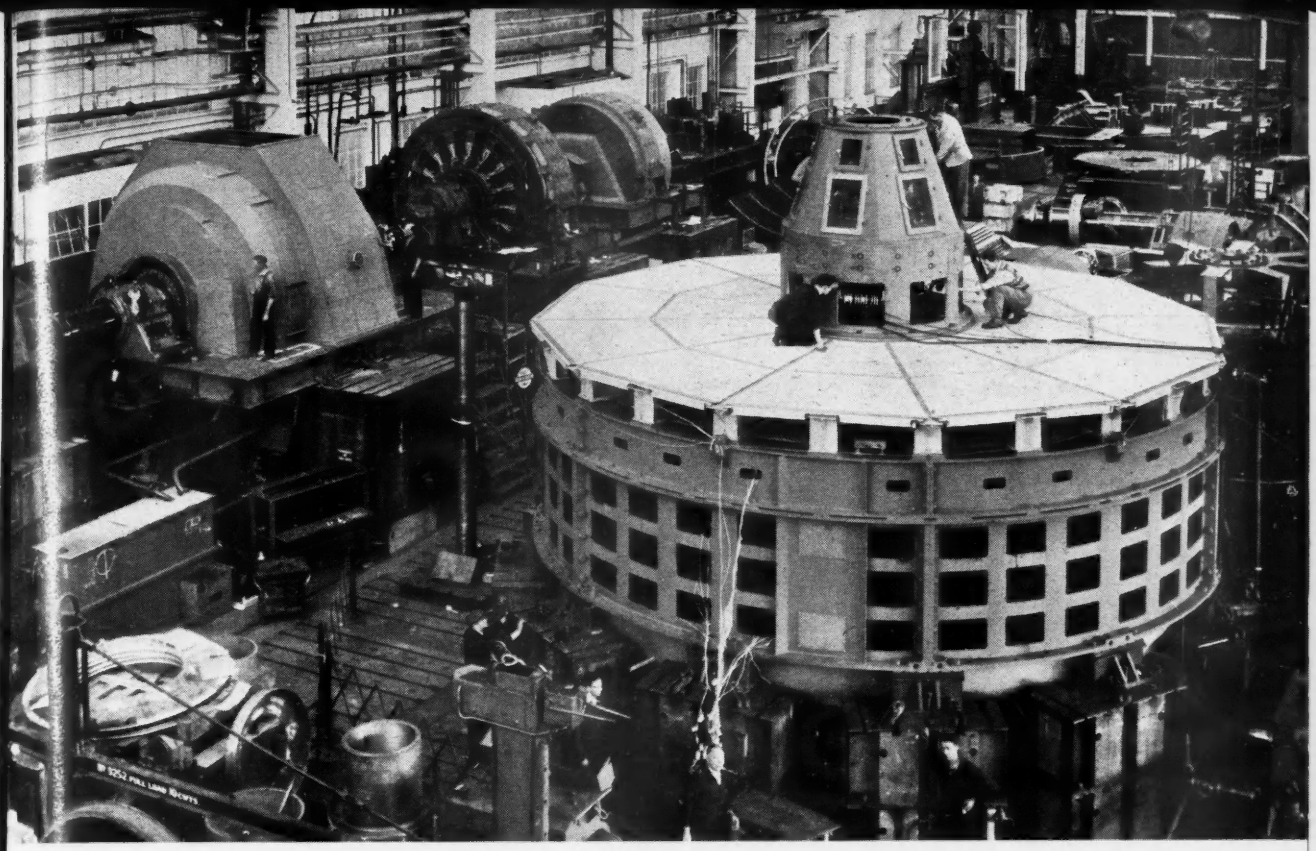
The Hire-Purchase Bill, the provisions of which were noted on page 51 of the *Electrical Review* of 9th July, received the Royal Assent on 30th July and became the Hire-Purchase Act, 1954. It comes into operation on 30th August. The Act differs little from the Bill as published, but there are additional provisions which affect both the Hire-Purchase Act, 1938, and the Hire Purchase and Small Debt (Scotland) Act, 1932. By s. 3 (1) any deposit or other initial payment, or any allowance for part-exchange of goods, is to form part of the total hire-purchase price in agreements under the 1938 Act (as amended). By s. 4 (2) " instalments " within the Act of 1932 include any sums " credited or to be credited to the hirer or the purchaser on account of any deposit or premium payable by him," whether in money or by part-exchange.

DOMESTIC APPLIANCE SURVEYS

Having in the past year covered by means of illustrated surveys in tabular form most of the more popular domestic appliances, we are to-day commencing a new series which is to appear at three-weekly intervals. This first survey, which gives a comprehensive picture of the cookers now on the market, will, like its predecessors, be found of considerable value for reference purposes by service centre staffs and by electrical contractors and retailers, not to mention the purchasers themselves. Fires, low temperature heaters, water heaters and laundry equipment will be the next subjects to be covered.

MORE FOR B.E.A.

Applications were invited this week for the long-anticipated loan of the British Electricity Authority. In effect the loan, amounting to £100 million, is an addition to the £150 million of 3½ per cent stock issued in 1950, for it is to be amalgamated with this stock in October. The proceeds will be used to repay temporary borrowings which at 31st July amounted to over £104 million. Issued at 100½ the new stock will have a yield comparable with other " nationalization " issues.



Testing Heavy Plant

Facilities Provided by the British Thomson-Houston Co., Ltd.

DURING a recent visit to the B.T.H. Rugby Works we were afforded an opportunity of inspecting the latest methods adopted there for testing large alternators, motors and transformers. Power is derived from motor generators installed in the new heavy plant factory, but their output, controlled from a central point, is available at five widely separated places in the works as a whole.

The installation includes two main d.c. generators, individually rated at 700 V and 2,400 A, which can be operated singly, in series or in parallel and are driven by 2,000 kW 1,500 r.p.m. synchronous motors. Alternating current is obtained from 12 kV generators of 20, 5 and 1 MVA, also driven by synchronous motors; further units of 5 and 10 MVA are to be provided. By using the motor of one of the d.c. generators as a synchronous condenser, an output of 28 MVA has been produced for testing the first 120 MVA 275/132 kV transformers for the British Electricity Authority.

The method of parallel operation of the alternators depends, first, upon the correct electrical "line up" between them and their driving motors so as to ensure satisfactory load sharing and, secondly, upon having the same voltage control irrespective of the number of alternators in parallel or the distance of the point of use. This result is achieved by the use of amplidyne exciters whose control fields are in series while the alternators are connected in parallel.

To secure heat dissipation and noise reduction, each motor and alternator has a closed circuit ventilating system with water cooling and water-cooled bearing. Only one d.c. and one a.c. generator are pony-motor started; the others are started on variable voltage, usually from the a.c. set, before being synchronized on to the main incoming line.

For over-voltage tests on transformers at a frequency that will prevent core saturation an alternator with a short-period rating of 4 MVA at 250 c/s has been provided. Measurements of induced voltages are made with a Haepely direct-reading peak and r.m.s. 900 kV voltmeter, a 1 metre sphere gap providing protection and a check. A set of three 350 kV transformers can be connected in cascade to produce a million volts, r.m.s. at 50 c/s. Other transformers up to 30 MVA are available for matching the demand of machines (including transformers) to the test alternators.

A new balancing and overspeed test house has been commissioned. The main feature of this building, which is situated away from the main factories, is a reinforced concrete tunnel, lined with timber and sand, 18ft in internal diameter and 48ft long, for accommodating rotors with diameters up to 14ft.

A 3,000 h.p. (peak) d.c. driving motor and a gear box with several sets of ratios are installed in a compartment

Above: One of four 44,444 kVA vertical water-wheel alternators for Roxburgh power station, New Zealand, and (on left) a 35,294 kVA 375 r.p.m. horizontal water-wheel alternator for Finlarig power station (North of Scotland Hydro-Electric Board). Both are shown undergoing tests at the B.T.H. Rugby works

separated from the tunnel by a bulkhead. Smooth acceleration and regenerative braking to a quick standstill are achieved by Ward-Leonard control. The controls are housed separately, together with electronic balancing apparatus and indicators of the correct functioning of the gravity-fed lubricating system. A long torque shaft transmitting the drive from the gear box provides, in effect, a flexible coupling, and correct and rapid alignment of the rotor is secured by a rotatable lining-up disc, to which is attached a clock gauge.

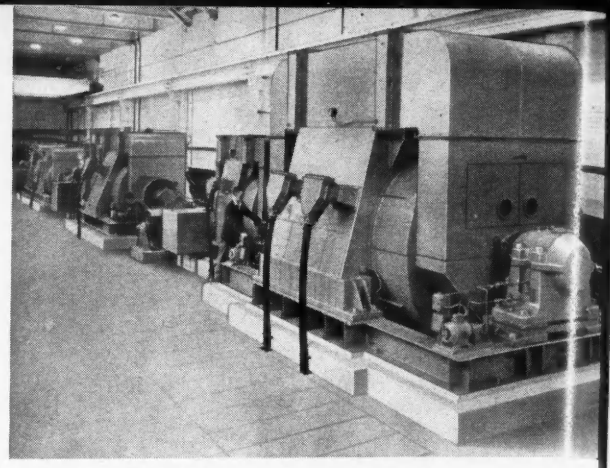
Rotors are lifted from railway trucks by a 120 ton crane and lowered into bearings on motorized carriages which move along a rail-track into the tunnel, when hydraulic jacks take the weight off the wheels and the carriages are bolted down.

Interlocks on all doors prevent entrance to the tunnel while a rotor is revolving above 100 r.p.m. No means of visual observation have been found necessary. Seismic vibration pick-ups mounted on the bearing pedestals generate a voltage which operates direct-reading instruments in the control room, enabling a vibration amplitude of 0·0001in to be detected and giving accurate measurement of the angular position of out-of-balance forces at each end of the rotor relatively to an arbitrary position on the shaft. Balance can thus be obtained in a very few runs before the overspeed tests are performed.

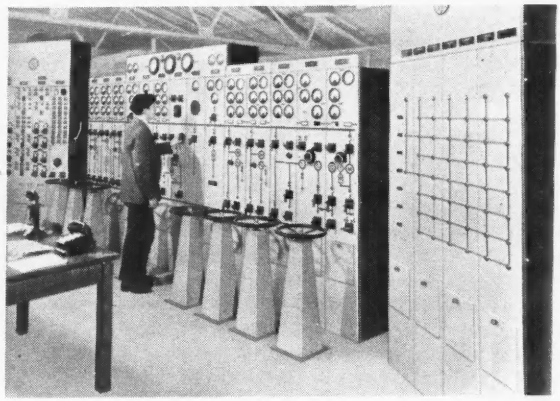
At the time of our visit two water-wheel alternators were undergoing general tests. This provided an unusual opportunity of seeing large fully assembled units of vertical and horizontal designs at the same time. The vertical machine, of 44,444 kVA, is destined for Roxburgh power station, which is being built on the River Clutha 100 miles from Dunedin, New Zealand. When completed to its full capacity of 320 MW (nearly half that at present installed in the whole country) the station will be by far the largest in New Zealand. The level of the river is being raised 150ft by a mass-concrete gravity-type dam to form a lake extending backward for eighteen miles.

This alternator, which is one of four bottom-bracket machines so far ordered, is to be driven at 136 r.p.m. by a Francis turbine made by the Dominion Engineering Co. of Montreal. The generation voltage of 11 kV will be stepped up to 220 kV for transmission. The diameter of the alternator is 29ft and its weight 330 tons. Passages in the foundations give a closed circuit for the cooling air through air/water heat exchangers.

Solidly coupled to the top of the shaft are the armatures of the self-cooled main and pilot exciters and the permanent magnet rotor of the generator governor. Among the electrical tests which will be applied to the remaining

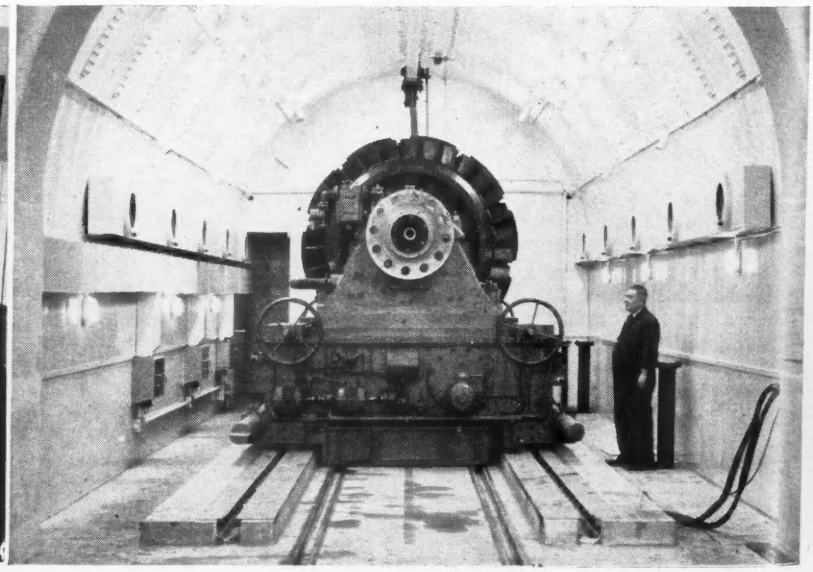


Test machine room, with 20,000 kVA motor alternator set (No. 4) in foreground



Test plant control room

The left hand picture shows the control desk for balancing tests and that on the right a rotor in the new overspeed test house



machines is a ring flux test on the stators before winding for comparing the core losses with those measured on the assembled machine.

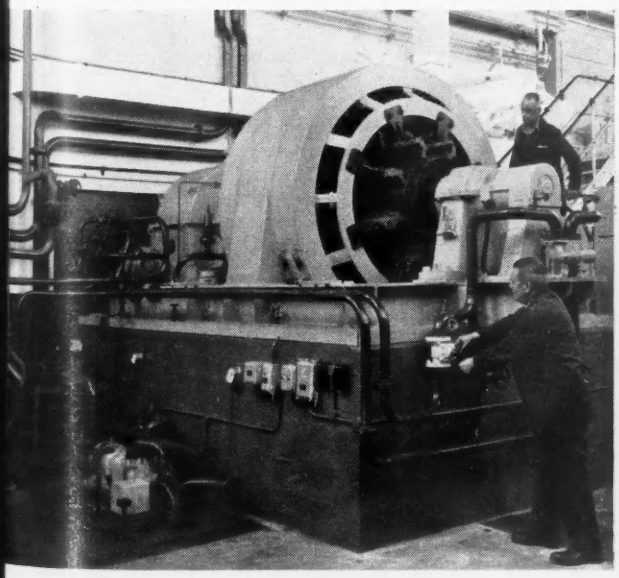
On completion of the tests, parts likely to be stored for some time before erection on site will be cocooned to avoid possibility of deterioration. For handling in transit slings are brought through the cocoons without destroying the air seal. The enclosed air is kept dry by silicon gel, the colour of which can be observed through a window to give indication of any leakage.

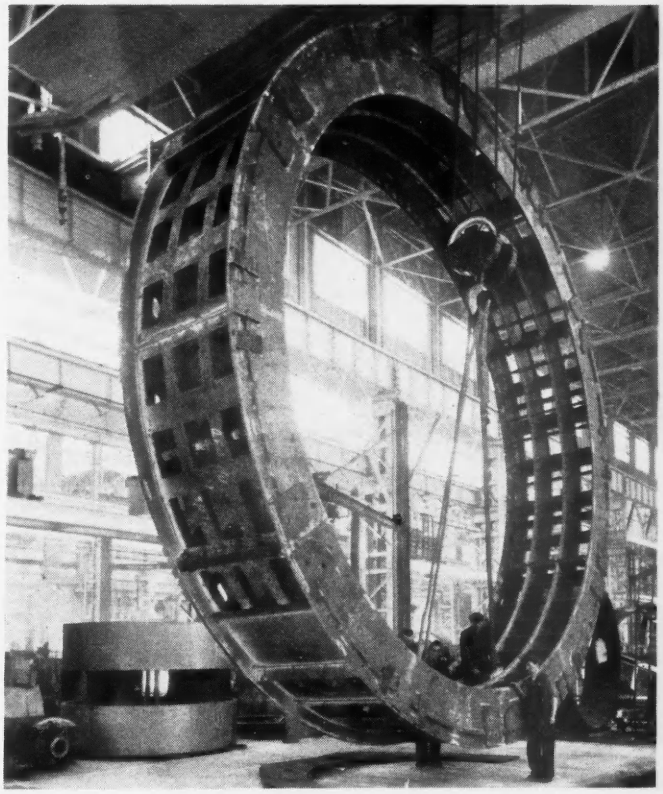
The rotors of these low-speed machines are of the laminated rim type. On the shaft are two forged flanges, to which are bolted heavy steel discs; between these are bolted eleven radial arms slotted at their outer ends to form a spider. Round the spider and held to it by taper keys in slots on the outer ends of its arms is a laminated steel rim built up from 0·25in steel segments bolted together. Keyed to dovetails in the outer periphery are the 44 poles made up of steel laminations hydraulically pressed together. The field winding is fabricated from h.d. copper with jig-saw joints. In the pole faces is a copper-bar damping winding brazed at the ends to copper plates embedded in the pole body, thus avoiding the need for pole-to-pole connectors.

The thrust bearing, mounted in the bottom bracket, is of the Michell segmental-pad type and is designed to carry a load of 375 tons, comprising the weights of the alternator rotor and turbine runner plus the hydraulic thrust. Brakes, which can also be used as jacks to lift the rotor off the bearing, operate against a ring of polished steel segments below the rotor rim.

The second fully assembled water-wheel alternator, a 375 r.p.m. 11 kV machine rated at 35,294 kVA (the largest horizontal unit in Great Britain), will be installed at the Finlarig power station—one of the group of five forming the Ben Lawers scheme of the North of Scotland Hydro-Electric Board and situated at the western end of Loch Tay. The gross head of 1,348ft is the highest yet for any of the Board's projects. A dam 1,250ft long and 130ft high will raise the level of the loch by 90ft and a 2 mile tunnel will carry the water to a surge shaft and valve house above the station. The alternator will be coupled to a twin-jet double overhung Pelton wheel, which will develop

3,000 h.p. (peak) d.c. driving motor in test house machine room





Stator frame for 44,444 kVA alternator for New Zealand

42,000 h.p. under a net head of 1,250ft and is now under construction in Scotland to the designs of Boving & Co.

The alternator stator weighs, with winding, 58 tons; the rotor, on a 30ft long shaft, weighs 127 tons, necessitating the removal of its sixteen poles and fan of the rotor plates to reduce the weight to 77 tons for transport to site. It is designed to withstand stresses at 705 r.p.m., the runaway speed of the turbine.

The stator frame is fabricated and, because of transport limitations, is in two parts, being split on the horizontal diameter. Dovetail key bars, welded inside the frame, support the stator core, which consists of segmental steel laminations insulated on both sides. The core is clamped between steel segmental flanges, and its slots carry the winding of the double-layer Roebel bar type, with transposed conductors to minimize losses. The main insulation on the slot portion of the bar is micafolium and on the end windings mica tape reinforced mechanically with glass tape.

On the rotor shaft are shrunk and keyed a number of thick steel plates. Dovetail slots, machined in the rotor body, carry the poles, on which are corresponding projections. Taper keys, driven in from both ends, pull the poles hard down on to the rotor body. The field coils are fabricated from copper strip, the main insulation being micanite and the inter-turn insulation asbestos. A heavy damping winding of copper bars is embedded in the pole faces. The alternator bearings are of the Michell type lubricated by filtered oil from an external system.

Ventilation is on the closed-circuit system, hot air being discharged at the bottom of the stator through two air/water heat exchangers in the machine pit. The cooled air is then forced into the alternator at each end by aerofoil fans on the rotor. The set's overall length is reduced by placing the

exciter between the stator and the main bearing at the end opposite the sliprings—an arrangement that eliminates the possibility of torsional oscillations and their reflection into the turbine governor.

The pilot exciter and governor generator are mounted on a common bedplate and flexibly coupled to one of the turbine runners. The governor generator provides a three-phase 50 c/s supply for a pendulum motor, any change in speed being thus relayed to the governor, which initiates the requisite correction to the setting of the turbine needle valves. Control equipment, also supplied by B.T.H., provides for automatic starting, synchronizing, loading and voltage regulation of the set by push-buttons either in the power station or at the remote control centre at Killin, at which any faults are indicated.

The two runners of the turbine are mounted at opposite ends of the alternator shaft. Each weighs two tons and consists of a forged steel disc to which are bolted eighteen buckets of stainless steel. The needle valves when fully open allow a jet of water 7·5in in diameter travelling at 190 r.p.m. to issue from the nozzle and impinge on the buckets, imposing a load of 20 tons on them twice in every revolution. The water used amounts to nearly 10 tons/sec at full load.

Engineering in Europe

Abstracts from Foreign Technical Journals

THE importance of the corrosion protection of metal overhead line masts cannot be overrated. It is, however, a difficult technical problem, which is aggravated by economic factors. Practically unlimited numbers and different kinds of protective varnishes are on the market so the *embarras de choix* makes another complication. The authors have tested not fewer than 42 protective methods—since not only the kind of varnish used, but its mode of application and, even more, the preparatory treatment of the metal surface are essential—by accelerated and long-time tests. The first were carried out in a fog chamber, the second in natural saline atmospheres.

The tabulated results and, even more strikingly, the pictures of the tested specimens make it evident that the preliminary phosphatization of the metal before varnishing goes far towards assuring an effective protection and thereby facilitates the choice of the varnish by making its special composition less important. On the other hand, certain types of varnish appear to be quite unsuitable since they cannot prevent corrosion even on correctly pre-treated metals. Absolute protection (within the time limits of the tests, i.e. 227 days) was provided only by a single type of treatment, viz. hot pickling and phosphatization, synthetic red-brown anti-rust coating and chlorinated rubber varnish. The economic side of the problem is also investigated at some length and a formula presented for comparing the relative merits of various kinds of treatment in this respect.—" Considerations and Tests on the Surface Protection of Metal Overhead Line Supports," M. Ferrario and G. Preti, *Energia Elett.*, Vol. 31, No. 3, pp. 197–205, March 1954, in Italian.

Designing Large Transformers

The problems arising in the design of modern v.h.v. transformers are thoroughly analysed by the author, not only as they present themselves to the designer, but also from the viewpoint of their subordination to the overall plan of the power station of which they form an important part. A balance must be drawn between the reasonable requirements of the planner and the designer's and manufacturer's possibilities. This refers, among others, to the relations between size of the transformer (limited by considerations of transportability) and the maximum output, guaranteed losses and s.c. reactance voltage. The methods available for solving this problem are considered. Also, the relation between output and reactance voltage is determined for a given core, and the no-load and short-circuit losses for different core types and sizes are compared. Due attention is paid to the important insulation problems of v.h.v. transformers which are closely related to the question of transformer testing at commercial frequencies and by surge voltages.

The author discusses winding design with special consideration of the necessity of rendering the windings surge-proof. The problem of the residual losses and the possibilities of reducing them is treated at some length, as well as the available methods of cooling. Comparisons are made between outputs and losses for radiator cooling with and without forced-draught ventilation. The permissible temperature rises of windings and oil are derived. The final sections of the paper deal with the calculation of the dynamical stresses on the windings at short-circuits and with the design of regulating gear and regulating windings for v.h.v. transformers.—" Some Problems of the Design of Large V.H.V. Transformers," J. Kopeček, *Elektrotechn. Obz.*, Vol. 43, No. 4, pp. 178–193, 1954, in Czech.

Rapid-Reclosing Equipment

The authors discuss the considerable advantages of rapid-reclosing equipment in the operation of medium-voltage systems and the difficulties to be overcome in applying this mode of operation to modern interconnected systems. A related problem is that of single- or two-stage interruption, since the latter introduces increased safety of operation in cases where the first, shorter, interruption is ineffective for clearing the fault (e.g., in cases of multiple lightning strokes or faults produced by birds, twigs, etc., dropped on the line), but at a price.

Experience with centralized rapid-reclosing collected during fifteen years' operation of 11–15 kV systems is then analysed with reference to statistics recording the causes of the disturbances. The difficulties of installing rapid-reclosing gear in such systems were overcome in different ways, mostly by using a busbar coupler as rapid-reclosing switch (the transformers being connected to one busbar and all the outgoing lines to another busbar). So far as possible, the interconnected systems were split up into feeder groups served by separate switches also suitable for rapid-reclosing so that, to a certain extent, staggered or selective rapid-reclosing could take place.

The second part of the paper is devoted to the planning of systems suitable for selective or sectional rapid-reclosing and reports a large-scale field test in an 11 kV system of 300 km total length with 15 circuit breakers equipped with rapid-reclosing gear. It was found that the combination of relays used worked very satisfactorily, that in most cases a single interruption (not too short) will clear the fault, so that selective reclosing by sections is the best principle for medium-voltage systems.—" Rapid-Reclosing in Medium-Voltage Systems," W. Kruse and F. Geise, *Elektrizitätswirtschaft*, Vol. 53, pp. 195–198, 20th April, 1954, and pp. 276–280, 20th May, 1954, in German.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

Power Factor Re-Examined

The Effect of Harmonics

By E. H. SIBLEY, B.Sc.(Eng., Hons. Lond.)*

IN most technical courses, and in many text books, the student is given the definition of power factor as the ratio of watts to volt-amperes in a circuit, and then a formal proof to show that in sinusoidally varying currents and voltages the power factor is given by cos ϕ, where ϕ is the phase angle between voltage and current. Thus, the student learns to associate power factor with cos ϕ, and is surprised at the suggestion that they are not necessarily the same thing.

To expand this still further, one may say that in any power system employing transformers, or supplying rotating machinery, *no matter how much* phase advancing plant is added, the power factor can *never* be unity. Also, although the "power factor" meter is reading unity, it may simply mean a (cos ϕ) of unity, the power factor being less.

To explain this apparent anomaly, it is necessary to reconsider the definitions and theory. Firstly:—

$$\text{Power factor} = \frac{\text{Watts}}{\text{Volt-amperes}} = \frac{P}{EI} \quad .. \quad (1)$$

It is easy to see the implication of this in the single-phase case, E and I being the r.m.s. voltage and current, and P the average power in the circuit.

Secondly, in a vector diagram, ϕ is the angle between the voltage and current vector. Taking the usual "proof" for cos ϕ = power factor, let the voltage be $e = \hat{E} \sin \theta$, where $\theta = \omega t = 2\pi ft$, and the current $i = \hat{I}_1 \sin (\theta - \phi)$; i.e., i lags e by an angle ϕ, $\hat{I}_1$ and $\hat{E}$ being the respective maxima.

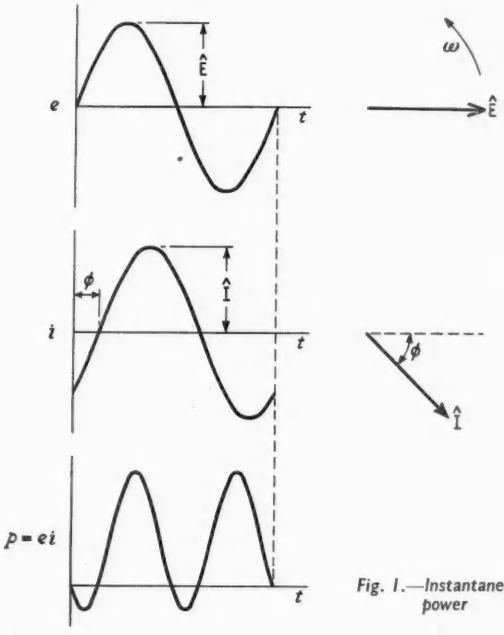


Fig. 1.—Instantaneous power

Then the instantaneous power $p = ei$ watts.

$$\therefore p = \hat{E} \sin \theta . \hat{I}_1 \sin (\theta - \phi)$$
$$= \hat{E}\hat{I}_1 \tfrac{1}{2} [\cos (\theta - \theta - \phi) - \cos (\theta + \theta - \phi)]$$
$$= \frac{\hat{E}\hat{I}_1}{2} [\cos \phi - \cos (2\theta - \phi)]$$

Now, as the mean value of a sine or cosine wave over a whole cycle is zero, the average power P becomes:—

$$P = \frac{\hat{E}\hat{I}_1}{2} \cos \phi$$

But $\hat{E}/\sqrt{2} = E$ (the r.m.s. voltage) and $\hat{I}_1/\sqrt{2} = I_1$,

$$\therefore P = EI_1 \cos \phi \quad .. \quad .. \quad (2)$$

Thus for sinusoidally varying currents and voltages, the power factor = cos ϕ.

A new case will now be considered where the waves are not simply sinusoidal. For example, the voltage wave the same as before, but the current wave $i = \hat{I}_1 \sin (\theta - \phi) + \hat{I}_3 \sin 3\theta$. Considering the instantaneous power, $p = ei = \hat{E}\hat{I}_1 \sin \theta \sin (\theta - \phi) + \hat{E} \sin \theta \, \hat{I}_3 \sin 3\theta$. The first term has already been evaluated above, the second term p_2 being given by:—

$$p_2 = \hat{E}\hat{I}_3 \sin \theta \sin 3\theta$$
$$= \hat{E}\hat{I}_3 \tfrac{1}{2} [\cos (\theta - 3\theta) - \cos (\theta + 3\theta)]$$
$$= \frac{\hat{E}\hat{I}_3}{2} [\cos 2\theta - \cos 4\theta]$$

Both of these terms have zero average value over a whole wave, so we reach the conclusion that the *current has increased*, but the *power has not*.

The r.m.s. current can be evaluated as follows:—

$$i = \hat{I}_1 \sin (\theta - \phi) + \hat{I}_3 \sin 3\theta$$
$$i^2 = \hat{I}_1^2 \sin^2 (\theta - \phi) + 2\hat{I}_1\hat{I}_3 \sin (\theta - \phi) \sin 3\theta + \hat{I}_3^2 \sin^2 3\theta.$$
$$\therefore i^2 = \frac{\hat{I}_1^2}{2} [1 - \cos 2(\theta - \phi)] + 2\hat{I}_1\hat{I}_3 . \tfrac{1}{2} [\cos (\theta - \phi - 3\theta)$$
$$- \cos (\theta - \phi + 3\theta)] + \frac{\hat{I}_3^2}{2} [1 - \cos 2.3\theta]$$

The mean value $I^2 = \frac{\hat{I}_1^2}{2} + \frac{\hat{I}_3^2}{2}$

Thus I, the r.m.s. current

$$I = \sqrt{\frac{\hat{I}_1^2 + \hat{I}_3^2}{2}} = \sqrt{I_1^2 + I_3^2} \quad .. \quad (3)$$

Here I_3 is the r.m.s. value of the third harmonic, i.e., the current of frequency *three* times the fundamental.

The power factor becomes

$$= \frac{VI_1 \cos \phi}{V\sqrt{I_1^2 + I_3^2}} = \frac{I_1}{\sqrt{I_1^2 + I_3^2}} \cos \phi$$

Hence the power factor is not simply cos ϕ unless I_3 is absent, i.e., there is no harmonic present.

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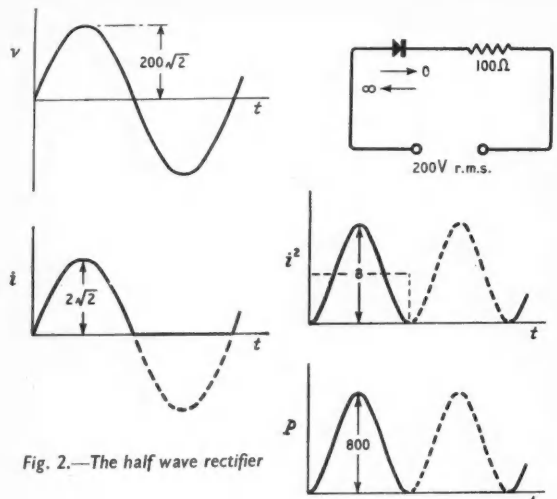


Fig. 2.—The half wave rectifier

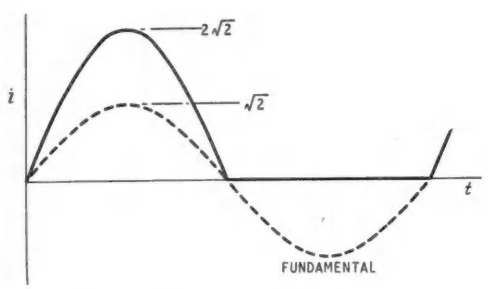


Fig. 3.—Current wave and fundamental

These results may be expanded to cover all cases.

(1) The r.m.s. of a complex wave is the root of the sum of all the separate r.m.s. components, if:—

$$i = I_0 + \hat{I}_1 \sin\theta + \hat{I}_2 \sin(2\theta + \alpha) + \hat{I}_3 \sin(3\theta + \beta) + \ldots$$

Where I_0 is a d.c. component, $\hat{I}_1$ the fundamental maximum, etc., then the r.m.s. current $I = \sqrt{I_0^2 + \frac{1}{2}(\hat{I}_1^2 + \hat{I}_2^2 + \hat{I}_3^2)}$ or $I = \sqrt{I_0^2 + I_1^2 + I_2^2 + I_3^2 + \ldots}$, where I_1, I_2, etc., are the separate r.m.s. values.

(2) The total power is the sum of the separate harmonic powers, there being no interaction; i.e., a third harmonic voltage with a sixth harmonic current produces no power.

$$\therefore P = V_0 I_0 + V_1 I_1 \cos\phi_1 + V_2 I_2 \cos\phi_2 + \ldots$$

where ϕ_1 is the angle between fundamental voltage and current waves, ϕ_2 between second harmonic waves, etc.

There are many types of apparatus in normal use which give rise to harmonics, i.e., cause harmonic currents to flow when the voltage applied is a pure sine wave. Examples of these are rectifiers, both metal and mercury arc; non linear resistors, for example, silicon carbide discs; transformers, and all machinery using highly saturated magnetic cores; fluorescent and arc lighting; welding, etc.

Taking a simplified case of the so-called "perfect" rectifier, that is, one which has negligible resistance in one direction of current flow, and infinite resistance to reversed polarity: consider such a rectifier in series with a load of 100 Ω, and a sinusoidal voltage wave of r.m.s. value 200 V (the peak being 200 √2 V). The circuit, voltage, current and power waves are shown in Fig. 2, the peak values being indicated. The power wave is of the (sine)^2 type; which means that it is at double the frequency and raised (since $\sin^2\theta = \frac{1}{2} - \frac{1}{2}\cos 2\theta$).

It will be seen that the current flows for one half cycle only. Hence the area under the (current)^2 curve is only one half of the area if there were no rectifier. Thus the r.m.s. value of current is the square root of one half of the non-rectified value, or

$$I = \sqrt{\tfrac{1}{2}} \times \frac{200\,\text{V}}{100\,\Omega} = 1{\cdot}414\,\text{A}.$$

Similarly the power curve is only one half as large in area. Thus the power is one half when rectified,

i.e., $P = \frac{1}{2} \times 200\,\text{V} \times 2\,\text{A} = 200$ watts.

Now the power factor

$$= \frac{\text{Power}}{\text{Volts} \times \text{Amps}} = \frac{200}{200 \times 1{\cdot}414} = 0{\cdot}707.$$

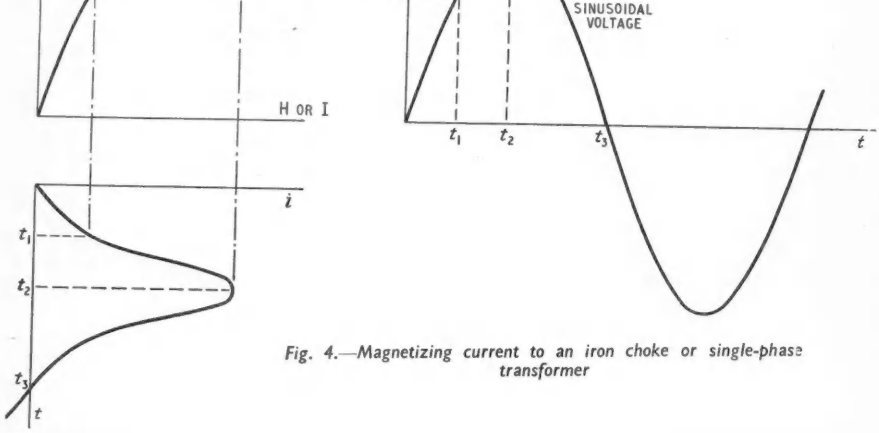


Fig. 4.—Magnetizing current to an iron choke or single-phase transformer

It will be seen that there is no inductance or capacitance in the circuit, and hence there is no question of "lagging" or "leading" power factor. Thus the correct term must be "distorting" or "harmonic."

Analysis of the current wave into sets of harmonics (known as Fourier analysis) shows that the "fundamental" current is in phase with the voltage, having an r.m.s. value of 1 A (maximum √2 A). This is shown in Fig. 3.

Checking back shows the power to be (r.m.s. fundamental voltage) × (r.m.s. fundamental current) × cosine of phase angle = 200 × 1 × 1 = 200 W as before.

Application of inductors or capacitors cannot increase the power factor above 0·707.

Turning to iron cored transformers the B/H or magnetization curve for steel is non-linear, and since the flux Φ is the product of flux density B and area A; also since the magnetizing force H is proportional to the magnetizing current I, the flux/magnetizing current curve is non-linear. If we apply a sinusoidal voltage to a coil enclosing iron or steel laminations the flux curve will tend to be sinusoidal. Hence, with reference to Fig. 4, it will be seen that the current drawn will be non-sinusoidal and can be shown to contain considerable third harmonic content (often about 20 per cent), less 5th and 7th, etc. Naturally on load this effect is somewhat masked by the extra fundamental current drawn.

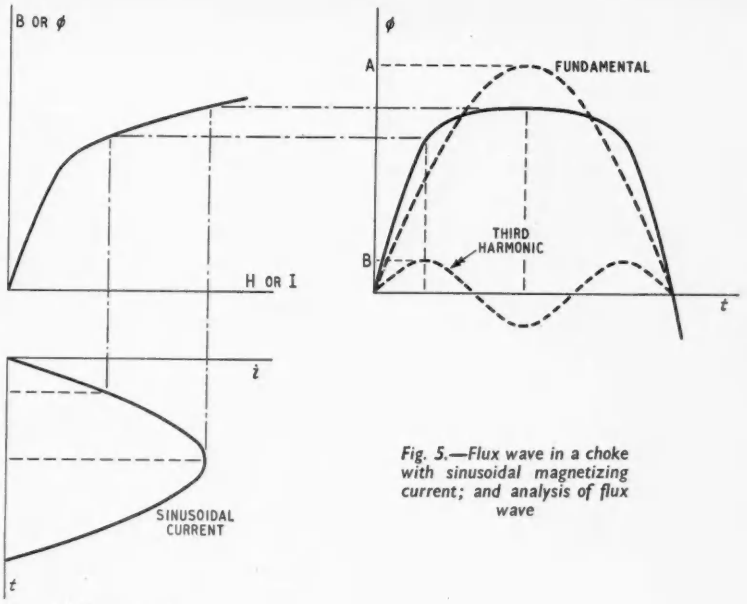


Fig. 5.—Flux wave in a choke with sinusoidal magnetizing current; and analysis of flux wave

In three-phase transformers the secondary phase voltage when star connected tends to contain third harmonics as follows:—Considering a sinusoidal current wave drawn from a supply to an iron cored coil the flux wave will be "flat topped" as shown in Fig. 5. Here a rough analysis shows that this splits into a fundamental and third harmonic of the form:—

$$\phi = A \sin \theta + B \sin 3\theta.$$

Now the secondary voltage is given by $e_2 = N\frac{d\phi}{dt}$

$$\therefore e_2 \propto A \cos \theta + 3B \cos 3\theta.$$

This has been plotted in Fig. 6. The phenomenon is well known in three-phase, and gives rise to the so called "oscillating neutral" effect. This is used in "hard control" of mercury arc rectifiers with grid operation for voltage adjustment.

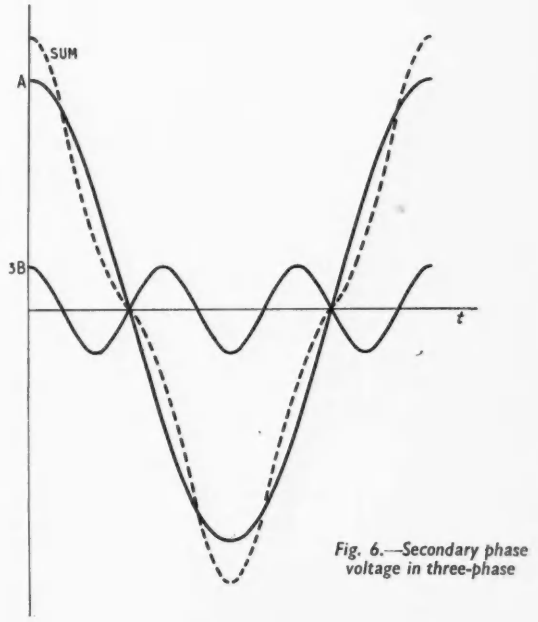


Fig. 6.—Secondary phase voltage in three-phase

In the measurement of power factor, there is only one simple accurate method; to use voltmeter, ammeter and wattmeter. There are many instruments known as power factor meters and in most cases they are simply "cos ϕ" meters, which rely on lack of distortion in normal circuits to give a reasonably accurate result.

The method is generally to provide two sets of coils, one of which is supplied with the circuit voltage and the other the current. By production of magnetic interaction, they cause instantaneous forces which move one coil, or a magnetic arm, into a position depending on the phase angle between the two fluxes. Hence they give a measure of the actual time angle between the two applied factors (viz., current and voltage in this case): if the frequencies were different the pointer would actually rotate as the waves went in and out of phase (this is, in fact, the principle of some types of synchroscope). The meter thus gives only an indication of the power factor if the waves are suspected of being at all distorted.

Summary

Only currents and voltages of the same frequency can produce power. Thus if an harmonic current of frequency different to the voltage is added, the overall current increases, the power does not, hence the power factor falls. The power factor meter generally tells the angle between fundamental voltage and current, and hence is not always accurate. No simple means of improving power factor due to distortion are available, although resonant acceptor and rejector circuits could be used for small scale work.

Generally the effect is not of great importance, except in interference with nearby telephone circuits, or with mercury arc rectifiers at large grid angles.

Loans for Brazilian Development

The Brazilian Bank for Economic Development has recently approved the following loans to State-owned enterprises:—Companhia Hidroelectrica do Sao Francisco, £2,200,000; Usina Electrica do Rio Bonito, Espirito Santo, £3,436,000; Hidroelectrica Sao Patricio, £14,000,000; Hidroelectrica do Funil, Bahia, £2,800,000.

Electric Cookers

SINCE our last survey of electric cookers on 16th October, 1953, about half a dozen new models have been placed on the market and half that number withdrawn. Minor improvements have also been incorporated in some of the existing models and various alternative finishes are offered. With the exception of Belling, Hounslow (" Chalex "), Moffats, Tricity and the " Falco Royal " models, prices are generally slightly higher than they were last year.

The tendency towards automatic operation continues. Most ovens in the normal type of cooker are now thermostatically controlled and " Simmerstats " are practically standard equipment on at least one boiling plate and sometimes on the grill boiler too. While the only new time-switch controlled cookers are two Canadian-built Moffats products, a greatly increased demand for the units previously available is reported from English Electric, Falco, Moffats, Simplex and Tricity.

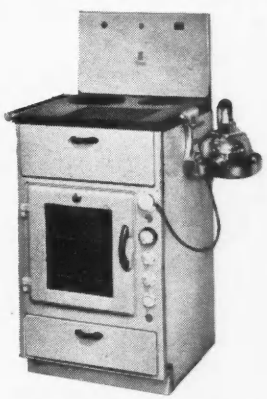
Although cookers tend to some extent to conform to a standard basic design, manufacturers remain active in their efforts to increase efficiency and give a touch of originality to their products, while at the same time keeping the price as low as possible. The reduction of the oven pre-heating time by half has been secured in the new B.N.E. model C.90, which is a development of the C.49. Incorporating a " Speedheat " oven with a loading of only 2,500 W, it attains a temperature of 400 deg F in approximately twelve minutes.

Following the growing practice of placing controls at waist height, the new low-priced " Creda Star " cooker incorporates a number of facilities not usually regarded as part of standard equipment. Two types are available, identical except that one has a 6¼in boiling plate in addition to the 8in plate and grill boiler. The large oven incorporated (2,540 cu in) includes a patent system of heat ventilation and non-tilt shelves. Both models can be supplied on a plinth or legs and an unconventional feature is the omission of a door on the grill compartment. Among table cookers the Dexray Engineering Co., Ltd., has introduced a new model.

Manufacturer:	Belling & Co., Ltd.						British National Electrics (" B.N.E.")	
Model	64AB Streamline	47AB	45A " Baby Belling "	51 " Wee Baby Belling "	53 " Big Baby Belling "	29	C.49	C.51
Type	Vertical	Vertical	" Baby "	" Baby "	—	Table cooker	Vertical, flush to floor	Vertical, flush to floor
Size (height, width & depth in inches)	37×23½×23	36×21×21	20×15½×18	11¾×11½×13¾	36×21×16	9×16½×12	36×21×21(plus 9in splashplate)	36×21×21 (plus 9in splashplate)
Oven type	Removable one piece	Removable one piece	Fixed	Fixed	Fixed	—	Fixed	Fixed
Oven size (height, width & depth. in)	16×15×13	13×13×16	11½×13×13	9½×9×9½	11½×11½×11½	—	13½×13½×15	13½×13½×15
Oven loading	3·4 kW	2·5 kW	1·2 kW	600 W	1 kW	—	2,200 W	1,800 W
Type of element	—	—	—	—	—	—	Plug-in side and bottom	Plug-in side
Oven control	Thermostat	Thermostat	3-heat	3-heat	3-heat	—	Thermostat	Thermostat
Hotplates	One 8in 2½ kW and one 6in 1 kW, all " Simmerstat " controlled	One 8in 1·8 kW (" Simmerstat " controlled) and one 6in 1 kW (3-heat control)	—	—	One 8in 1·8 kW	—	One 8in 1,800 W and if required one 6½in 1,000 W solid (radiant extra)	
Grill or grill boiler	10½in×8in 2·3 kW grill boiler	10½in×8in 2·3 kW grill boiler	10½in×8in 2 kW grill boiler	9in×7in 1·75 kW grill boiler	10in×7in 2 kW grill boiler	10½in×8in 2 kW grill boiler	10½in×8in 2 kW grill boiler	10½in×8in 2 kW grill boiler
Hotcupboard or grill compartment (height, width & depth in inches)	7×16½×16½	6×18½×15½	4½×17½×15	—	5×19×14	7×10¾×10¾	6¾×17×17¾	6¾×17×17¾
Storage drawer (height, width & depth in inches)	—	4×16×15	—	—	—	—	Large	Large
Storage drawer loading	—	—	—	—	—	—	—	—
Special features	Inner glass door, automatic oven flood light and (as extra) wheels with brake	Inner glass door	Available on stand (£2 4s extra), on cabinet (£4 8s extra)	—	Stand £2 extra. Cabinet £4 extra. Switch interlock limits load to 3 kW	—	Interchangeable 2/3 plate hob. Drop-down oven door	Interchangeable 2/3 plate hob
Finish	White or cream, black hob, vitreous throughout			Cream and black vitreous	Cream and black vitreous	White or cream & black vitreous	Two-tone cream vitreous enamel	Two-tone cream vitreous enamel
Price	£49 10 0	£32 5 0	£13 15 0	£6 19 6	£15 10 0	3-heat: £6 18 0 S'stat: £7 12 0	2-plt: £33 10 0 3-plt: £36 5 0	2-plt: £31 7 6 3-plt: £34 7 6

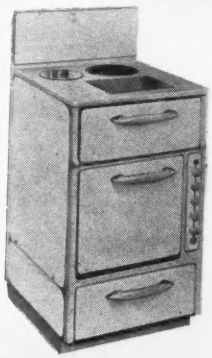
Manufacturer:	"B.N.E." (*continued*)		Carron Company		Dexray Engineering Co., Ltd.		English Electric Co., Ltd.	
Model	CS	C90	H.3	H.2	C.2	C6	2009D	2011
Type	Vertical, legs	Vertical, flush to floor	Vertical	Vertical	Table	Table	Cabinet, plinth	Cabinet, plinth
Size (height, width & depth in inches)	36×21×21 (plus 9in splashplate)	36×21×21 (plus 9in splashplate)	36×21×21	36×21×18¼	16×22×15	20×16½×15½	36×22×22¼ (plus 6¼in splashplate)	36×22×22¼ (52½in to top of hob light)
Oven type	Fixed	Fixed	Removable sides and bottom	Removable sides and bottom	—	Fixed	Fixed	Fixed
Oven size (height, width & depth in inches)	13½×13½×15	13½×13⅝×15	15×13½×15½	13×13¼×14½	—	14×12×13½	13½×15½×14	13½×15½×14
Oven loading	2,200 W	2,500 W	2,600 W	2,200 W	—	1,800 W	2,800 W	2,800 W
Type of element	Plug-in side and bottom	Plug-in side and bottom	Porcelain sections in sheet steel frame	Porcelain sections in sheet steel frame	—	Bottom heat	Stainless steel cased plug-in at sides, fixed rod elements below oven floor	
Oven control	Thermostat	Thermostat	Thermostat	Thermostat	—	Thermostatic	Thermostat	Thermostat
Hotplates	One 8in 1,800 W and if required one 6¼in 1,000 W solid (radiant extra)	One 8in 1,800 W radiant plate with simmer control and one 6¼in 1,000 W solid	One 8in 1,800 W and one 6¼in 1,000 W solid	One 8in 1,800 W solid	One 6¼in	—	One 8in 1,800 W ("Simmerstat") and one 6¼in 1,000 W (3-heat)	One 8in 1,800 W and one 6¼in 1,000 W (both "Simmerstat")
Grill or grill boiler	10½in×8in 2 kW grill boiler	10½in×8in 2 kW grill boiler	10½in×8in 2,000 W solid grill boiler	10½in×8in 2,000 W solid grill boiler	7in×9½in 1,800 W grill boiler	7½in×9¾in 1,200 W grill boiler, 3-heat control	10½in×8in 2,500 W grill boiler (3-heat)	10½in×8in 2,500 W grill boiler, "S'stat"
Hotcupboard or grill compartment (height, width & depth in inches)	6¾×17×17¾	6¾×17×17¾	6¼×17¾×18½	6¾×17¾×12¾	Grill compartment 7×11×14	Grill compartment 3½×12×13	5×18¾×18½	5×18¾×18½
Storage drawer (height, width & depth in inches)	—	Large	5¾×15½×19½	—	—	—	5½×18×17⅜	5½×18×17⅜
Storage drawer loading	—	400 W	500 W	—	—	—	—	—
Special features	Interchangeable 2/3 plate hob	"Speedheat" oven, "Pyrex" glass casserole grill pan, adjustable feet	Glass door, heated or unheated drawer to H.3, illuminated indicating splashplate, kettle plug attachment, kettle holder and (18s 9d extra) towel rail		—	—	One-piece hotcupboard. Glass panel oven door 15s extra	Automatic control with timer, ringer, pilot & hob lights. Glass panel oven door 15s extra
Finish	Two-tone cream or mottled grey vitreous enamel	Two-tone cream vitreous enamel	Cream with black or green hob	Cream with black or green hob	Vitreous and cream stove	Vitreous hob, cream body, black base	Cream or white with black	Cream, or white with dove grey and dappled grey interior
Price	2-plt: cream: £27 0 0, grey: £26 8 0, 3-plt: cream: £30 12 0, grey: £30 0 0	£48 0 0	£40 2 6 to £50 16 0	£32 14 0 to £40 10 0	£12 5 0	£13 18 0	£39 15 6	£58 0 0

Manufacturer:	Falco (See also p. 278)
Model	15B
Type	Vertical, plinth
Size (height, width & depth in inches)	36×22½×19¼
Oven type	3-piece removable
Oven size (height, width & depth in inches)	13×13×13
Oven loading	2,400 W
Type of element	Plug-in
Oven control	Thermostat
Hotplates	One 8in solid 1,800 W, 3-heat
Grill or grill boiler	2 kW solid grill boiler, 3-heat
Hotcupboard or grill compartment (height, width & depth in inches)	5×18×13¼
Storage drawer (height, width & depth in inches)	—
Storage drawer loading	—
Special features	Utensil drawer (£1 extra if required)
Finish	Cream, white or cream and green enamel
Price	£29 11 6



Carron H.3

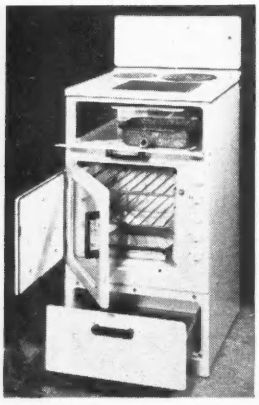
Belling 47AB



B.N.E. model C.90

Below: English Electric 2009D with glass oven door

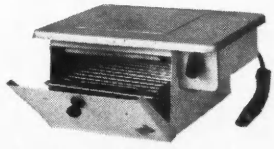
Manufacturer:	Falco *(continued)*		General Electric Co., Ltd.				L. G. Hawkins	C. Hounslow & Co.
Model	16B	"Royal"	DC114	DC452 and DC453	DC752 and DC753	DC138 "Junior"	"Ovenette"	"Chalex" 3-heat
Type	Vertical, plinth	Vertical	Plinth	Leg or plinth	Leg or plinth	Table model	Table	Table
Size (height, width & depth in inches)	36×22½×19½	36×23×23½ (49in to splash-plate)	44×21×21	43¾×21×17	43¾×21×21	14×20×14	11¼×14 dia.	7¾×11¼×17
Oven type	3-piece removable	Removable	Three-piece removable	Three-piece removable	Three-piece removable	Fixed	—	—
Oven size (height, width & depth in inches)	13×13×14½	16½×17½×15½	13×15¼×13½	13½×12⅜×14¼	13½×12⅜×16¾	10×12×12	—	11½×10½×6¼
Oven loading	2,400 W	3,500 W	2,450 W	2,250 W	2,500 W	800 W (plus grill boiler)	700 W	—
Type of element	Plug-in	Plug-in	Sheathed wire	Fireclay panel	Fireclay panel	Fireclay panel	Spiral	Wired porcelain
Oven control	Thermostat	Thermostat. Manual or automatic timer	Thermostatic	Thermostatic	Thermostatic	"On-off" switch	—	3-heat
Hotplates	One 8in solid 1,800 W and one 6¼in solid 1,000 W, 3-heat	Two 8in and one 6¼in radiant, "Simmerstat" control	One 8in 1,800 W ("Simmerstat") and one 6¼in 1,000 W solid (3-heat)	One 8in 1,800 W solid (3-heat)	One 8in 1,800 W and one 6¼in 1,900 W solid (3-heat)	—	—	—
Grill or grill boiler	2 kW solid grill boiler, 3-heat	3 kW grill, "Simmerstat"	2,000 W grill boiler	2,000 W grill boiler	2,000 W grill boiler	2,000 W grill boiler	—	1,800 W grill boiler
Hotcupboard or grill compartment (height, width & depth in inches)	5×18×13½	4×17½×16	6½×17¾×18¼	6×17¾×12½	6×17¾×15¾	—	—	—
Storage drawer (height, width & depth in inches)	—	—	5½×13¼×20	—	—	—	—	—
Storage drawer loading	—	—	400 W	—	—	—	—	—
Special features	Utensil drawer (£1 extra) if required	Automatic oven time switch, tubular light on splashplate	Drop-down type oven door	—	—	Plate warming compartment	Collar (12s 6d extra) for increasing capacity and reducing heat	—
Finish	Cream, white or cream and green enamel	White or cream vitreous enamel	Green and cream, two-tone ivory or white enamel	Two-tone ivory or green and cream vitreous enamel	Two-tone ivory or green and cream vitreous enamel	Two-tone ivory or white with black hob	Chromium	Grey mottled stove enamelled
Price	£31 5 6	£85 0 0	£37 12 6	Leg: £27 0 0 Plinth: £28 12 0	Leg: £30 16 0 Plinth: £31 18 0	£12 0 0	£4 9 6	£6 11 3



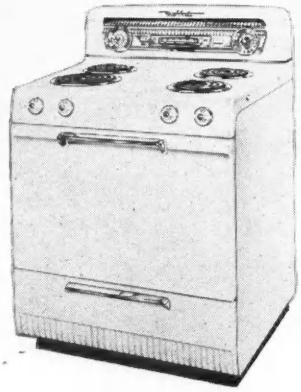
Jackson 194J

L. G. Hawkins "Ovenette"

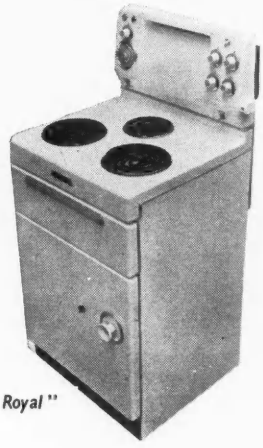
G.E.C. DC.114



Hounslow "Chalex" three heat table cooker



Right: Moffats 304



Right: "Falco Royal"

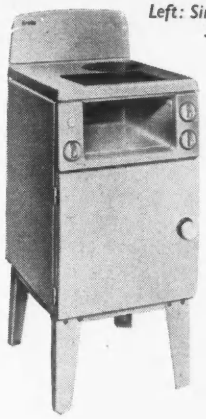
Manufacturer:	C. Hounslow *(continued)*		Jackson Electric Stove Co., Ltd.					
Model	"Regal"	"Chalex Bijou"	190J	191J	192J	194J	"Two-Ninety"	
Type	Breakfast	Table or on stand	Vertical, legs or plinth	Vertical, legs or drawer	Vertical, drawer	Vertical, drawer	Vertical, legs	
Size (height width & depth in inches)	7×9½×12½	13×13×19	36×21×17¾	36×21×21	36×21×17¾	36×21×21	36×22⅝×17⅜ (42½in high to splashplate)	
Oven type	—	Fixed	Removable element guards	Removable element guards	Removable element guards	Removable element guards	Removable element guards	
Oven size (height, width & depth in inches)	11×8×4	9×11×11½	12⅝×12½×13¼	12⅝×12½×16½	12⅝×12½×13¼	12⅝×12½×16½	12⅝×12⅝×13⅝	
Oven loading	—	1,250 W	1,780 W	2,100 W	1,780 W	2,100 W	1,780 W	
Type of element	—	Wired porcelain	Spirals in ceramic tubes	Spirals in ceramic tubes	Spirals in ceramic tubes	Spirals in ceramic tubes	Spirals in ceramic tubes	
Oven control	—	3-heat, two switches	Thermostat or 3-heat	Thermostat or 3-heat	Thermostat	Thermostat	Thermostat	
Hotplates	—	One 5½in 750 W	One 8in 1,800 W solid, 3-heat switch	One 8in 1,800 W and one 6½in 1,000 W solid, 3-heat switches	One 8in 1,800 W solid, 3-heat switch	One 8in 1,800 W and one 6½in 1,000 W solid, 3-heat switches	One 8in 1,800 W solid, with "Simmerstat"	
Grill or grill boiler	9in×7in 750 W grill boiler	—	10½in×8in 2,000 W grill boiler	10½in×8in 2,000 W grill boiler	10½in×8in 2,000 W grill boiler	10½in×8in 2,000 W grill boiler	10½in×8in 2,000 W grill boiler	
Hotcupboard or grill compartment (height, width & depth in inches)	—	—	4½×18×13¾	4½×18×18½	4½×18×13¾	4½×18×18½	6×17×11	
Storage drawer (height, width & depth in inches)	—	—	—	—	4½×16½×14½	4½×16½×18½	—	
Storage drawer loading	—	—	—	—	400 W	400 W	—	
Special features	—	—	—	—	Glass panel door with outer door, "Cleanlite" cream splash vitreous enamel oven interior		Rollers on legs, towel rail each side of cooker, hand-level controls	
Finish	Grey mottled stove enamelled	Grey mottled stove enamelled	Leg: Grey splash vitreous enamel. Plinth: Black vitreous enamel hob, two-tone ivory front and sides		Two-tone ivory or all white vitreous enamel		Cream with green relief, cream or French grey with white relief	
Price	£2 13 2	£8 11 11	Leg: £26 8 0 Plinth: £28 0 9	Leg: £30 0 0 Plinth: £31 14 0	Cold drawer: £33 15 0 Heated drawer: £35 12 0	Cold drawer: £38 6 0 Heated drawer: £40 0 0	£25 12 6	

Manufacturer:	Moffats (Overseas), L'd.						Parnall (Yate), Ltd.	
Model	3225	3164	3144	4408	304	306	EC6/15	EC12C
Type	Horizontal	Horizontal	Horizontal	Vertical	Vertical	Vertical	Vertical with warming drawer	Vertical with warming drawer
Size (height, width & depth in inches)	44⅝×39½×25½	44⅝×39½×25½	44⅝×39½×25½	48½×22⅞×25¼	45½×30×25½	45½×30×25½	36×21×19 (42in high to splashplate)	36×23×25 (40in high to splashplate)
Oven type	Fixed. Two ovens	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
Oven size (height, width & depth in inches)	14×16⅝×20	14×16⅝×20	14×16⅝×20	14×16⅝×20	15½×24×18½	15½×24×18½	13×12¾×14¾	11½×14⅝×16¾
Oven loading	Grill: 3 kW Bottom: 1·5 kW	Grill: 3 kW Bottom: 1·5 kW	Grill: 3 kW Bottom: 1·5 kW	—	Grill: 3 kW Bottom: 2·4 kW	Grill: 3 kW Bottom: 2·4 kW	2,500 W	4,000 W
Type of element	"Conrad"	"Conrad"	"Conrad"	"Conrad"	"Conrad"	"Conrad"	Sheathed side elements	Sheathed, top and bottom
Oven control	Thermostat	Thermostat	Thermostat	Thermostat	Thermostat	Thermostat	2-stage thermostat	3-stage thermostat
Hotplates	Two 8in Three 6½in	Two 8in Two 6½in	Three 6½in One 8in	Three 6½in One 8in	Three 6½in One 8in	Three 6½in One 8in	One 8in 1,800 W One 6½in 1,000 W 3-heat switch or "Simmerstat"	Two 8in 1,800 W Two 6½in 1,000 W 3-heat switch or "Simmerstat"
Grill or grill boiler	Grill	Grill	Grill	Grill	3,000 W grill	3,000 W grill	Grill boiler, solid or radiant, to order (2,000 W)	Grill in top of oven (2,000 W)
Hotcupboard or grill compartment (height, width & depth in inches)	10×14×21½	14×16⅝×20	14×16⅝×20	—	—	—	6½×19×15¾	—
Storage drawer (height, width & depth in inches)	10×14×21½	10×14×21½	10×14×21½	10×14×21½	6×21×18	6×21×18	5½×18⅝×17	5½×19×15¼
Storage drawer loading	500 W	500 W	500 W	500 W	500 W	500 W	500 W	500 W
Special features	All have automatic control of ovens from built-in clock. 3225 and 3164 also have automatic control of hotplates, floor levelling facilities, etc.						Magnetic door catch on oven and hotcupboard	Drop down balanced oven door
Finish	White titanium enamel	White titanium enamel	White titanium enamel	White titanium enamel	White titanium enamel	White titanium enamel	White or cream vitreous enamel	White or cream vitreous enamel
Price	£153 10 0	£125 0 0	£113 10 0	£89 10 0	£110 10 0	£103 10 0	Available on application (export only)	

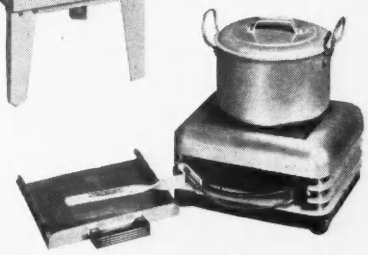
Manufacturer:	Revo Electric Co., Ltd.							Simplex ("Creda"
Model	"Monarch"	"Princess" 461	"Princess" 463	"Princess" 464	R808	"Pearless"	"Dandy"	EV.13
Type	Vertical, plinth	Vertical, plinth	Vertical, plinth	Vertical, plinth	Vertical, legs or plinth	Horizontal	Table	Vertical, warmi ng d rawer
Size (height, width & depth in inches)	36×23×24 plus splashplate 12in	36×21×18	36×21×20	36×21×21	35¼×21¾×16½	17¾×21×15 (36in on stand)	7¾×13×10¾	36×21×19½ (Splashplate 7in)
Oven type	Removable	One piece, removable	One piece, removable	One piece, removable	Removable	Fixed	Fixed	Removable
Oven size (height, width & depth in inches)	14×15⅜×13¾	13½×12½×13¼	13½×12½×13¼	13½×12½×16¾	13¼×12½×13¼	12¼×11⅝×13	—	13¾×13×13½
Oven loading	2·1 kW	2·1 kW	2·1 kW	2·5 kW	1·9 kW	900 W bottom plus grill boiler	1¼ kW	2,500 W
Type of element	Sheathed	Refractory panel	Refractory panel	Refractory panel	Refractory panel	Grill	Grill	Fixed
Oven control	Thermostat	Thermostat	Thermostat	Thermostat	Thermostat	Thermostat	—	Thermostat
Hotplates	Two 8in 1,800 W	One 8in 1,800 W	One 8in 1,800 W One 6½in 1,000 W	One 8in 1,800 W One 6½in 1,000 W	One 8in 1,800 W	One 6½in 1,000 W	—	One 8 in 2,000 W One 6¼ in 1,000 W solid
Grill or grill boiler	2,200 W grill boiler	2,200 W grill boiler	2,200 W grill boiler	2,200 W grill boiler	2,200 W grill boiler	2,000 W grill boiler	1¼ kW grill boiler	2,000 W grill boiler
Hotcupboard or grill compartment (height, width & depth in inches)	5½×16¾×20	6½×18¾×13¾	6½×18¾×13¾	6½×18¾×13¾	5×17⅛×12½	10¼×7×13	—	5½×18½×14
Storage drawer (height, width & depth in inches)	—	5×16×13½	5×16×13½	5×16×13½	—	—	—	7¼×16¾×17
Storage drawer loading	—	300 W	300 W	300 W	—	—	—	400 W
Special features	Eye level switches	—	—	—	—	Maximum consumption 3 kW	—	—
Finish	Cream	Two-tone ivory or green and cream vitreous enamel	Two-tone ivory or green and cream vitreous enamel	Two-tone ivory or green and cream vitreous enamel	Pastel grey mottle with white panels or all two-tone ivory	Black and cream enamel	Cream and black enamel	Two-tone ivory, cream and green or silver grey
Price	£30 0 0	£30 8 0	£31 7 0	£36 6 0	£25 17 0	£18 15 0 Stand £1 17 6	£2 17 6	From £34 12 0

Manufacturer:	Simplex Electr c Co., Ltd. *(continued)*				Tricity Cookers, Ltd.			
Model	"Comet," models DH.1-4	"Super Comet DH.6	"Star" 305	"Star" 310	"Queen" 535	528	Double 528	473A
Type	Horizontal, plinth or legs	Horizontal, plinth	Vertical, plinth or legs	Vertical, plinth or legs	Vertical or horizontal	Vertical	Horizontal	Vertical
Size (height, width & depth in inches)	36×36×21 (Splashplate 8in)	36×36×25½ (Height to top of lamp 50½in)	36×18⅛×23¼ (splashplate 7½in)	36×18⅛×23¼ (splashplate 7½in)	36×22×22	36×19¾×16	36×40×16	36×19¾×15½
Oven type	Removable	Removable	Removable	Removable	Fixed	Removable (except top)	Removable (except top)	Removable (except top)
Oven size (height, width & depth in inches)	15×14⅛×16⅝	15×14½×16⅝	13¾×15⅝×14⅝	13¾×15⅝×14⅝	14⅜×15¾×14½	10½×11½×12¾	Two 10½×11½×12¾	10½×11×12¼
Oven loading	3,450 W	3,450 W	2,200 W	2,200 W	2,490 W	1,150 W	Two ovens each 1,150 W	1,150 W
Type of element	Plug-in	Plug-in	Tubular fixed	Tubular fixed	Plug-in	Fixed	Fixed	Fixed
Oven control	Thermostat	Thermostat	Thermostatic	Thermostatic	Thermostat	Thermostat	Thermostat	3-heat
Hotplates	DH.1 and 2: Three 8in 2,000 W. DH.3 and 4: Also one 6¾in 1,000 W	Two 8in 2,000 W Two 6¾in 1,000 W	One 8in ("Simmerstat")	One 8in ("Simmerstat") One 6¼in (3-heat)	One 8in 1,600 W radiant One 6¼in 1,000 W solid (both "S'stat")	One 6¼in 1,000 W solid (3-heat)	One 8in 1,800 W Two 6¼in 1,000 W solid (3-heat)	—
Grill or grill boiler	1,500 W grill	1,500 W grill	2,000 W solid grill boiler	2,000 W solid grill boiler	2,250 W grill boiler	1,800 W grill boiler	Two 1,800 W grill boilers	1,800 W grill boiler
Hotcupboard or grill compartment (height, width & depth in inches)	5½×13¼×14¼	5½×13½×14½	4¾×11¾×17	4¾×11¾×17	8×13½×17	4×13×11½	Two grill compartments each 4×13×11½	4×16×13½
Storage drawer (height, width & depth in inches)	5½×13½×14½	5½×13½×16	—	—	—	—	—	—
Storage drawer loading	400 W	400 W	—	—	—	—	—	—
Special features	Horizontal switch panel, built-in cupboard (DH.2-4)	Time clock, oven interior light	Waist level switches	Waist level switches	Auto control strip light, timer & "S'stat" controlled 13 A socket	Master selector switch	Four plates, two ovens	—
Finish	Two-tone ivory or white	White	Grey & white or cream	Grey & white or cream	White or ivory vitreous enamel	Ivory vitreous enamel	Ivory vitreous enamel	Ivory vitreous enamel
Price	From £70 7 0	£115 10 0	From: £25 10 0	From: £27 10 0	£68 5 0	£22 16 6	£47 3 0	£16 18 3

Manufacturer:	Warnford
Model	"Mastercook"
Type	Table
Size (height, width & depth in inches)	$9 \times 8 \times 4\frac{3}{4}$
Oven type	—
Oven size (height, width & depth, in)	—
Oven loading	—
Type of element	Solid
Oven control	—
Hotplates	—
Grill or grill boiler	750 W grill boiler
Hotcupboard or grill compartment (height, width & depth in inches)	$7 \times 7 \times 1\frac{1}{2}$
Storage drawer (height, width & depth in inches)	—
Storage drawer loading	—
Special features	Operates on lighting circuit. Heat-resisting glass frypan
Finish	Bright polished
Price	£3 7 6

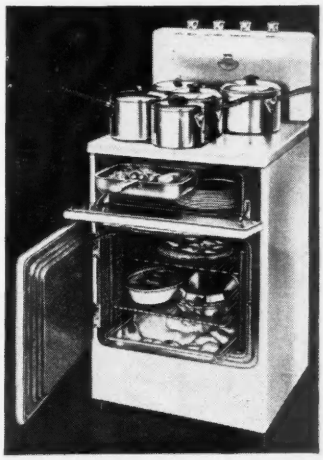


Left: Simplex "Creda Star" 305 with legs

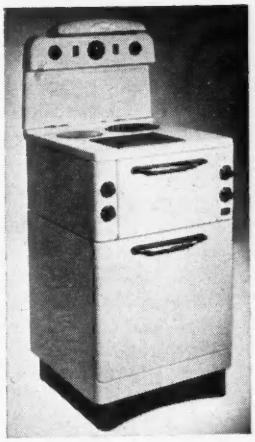


Warnford "Mastercook"

Right: Revo "Monarch"



Parnall (Yate) EC.12C



Left: Tricity "Queen"

LIST OF MANUFACTURERS

Belling & Co., Ltd., Bridge Works, Southbury Road, Enfield.
British National Electrics, Ltd., Newarthill, Motherwell, Lanarkshire.
Carron Company, Carron, Falkirk.
Dexray Engineering Co., Ltd., 34, Ardwick Green South, Manchester, 13.
English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.
Falco Electrical Appliances, Ltd., Corporation Road, Audenshaw, Manchester.
General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.
Hawkins, L. G., & Co., Ltd., 30–35, Drury Lane, Kingsway, London, W.C.2.
Hounslow, C., & Co., Ltd., Chalex Works, Southwick.
Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.
Moffats (Overseas), Ltd., 1, Newman Street, London, W.1.
Parnall (Yate), Ltd., 255, North Circular Road, London, N.W.10.
Revo Electric Co., Ltd., Tipton, Staffs.
Simplex Electric Co., Ltd., Creda Works, Blythe Bridge, Staffs.
Tricity Cookers, Ltd., 109, Kingsway, London, W.C.2.
Warnford Constructions, Ltd., 1, Chesterfield Street, London, W.1.

NEW CABLE STANDARDS

A REVISION of the 1942 edition of B.S.480, which deals with paper insulated cables, has just been published in two separate self-contained parts by the British Standards Institution. Part I deals with lead or lead-alloy sheathed cables for working voltages up to and including 33 kV, while Part II is concerned with aluminium sheathed cables for working voltages up to and including 22 kV.

Each part of the Standard now contains "quality" clauses dealing with the composition of the various components of the cable. A basic reference temperature of 20 deg C for the properties of annealed high conductivity copper has been adopted. The practice of specifying minimum and maximum diameters over sheath and overall has been abandoned in favour of nominal diameters. Cables which comply with the requirements for minimum thickness of insulation and sheath will have the stated nominal diameters, which allow reasonable manufacturing tolerances.

Tests are now divided into acceptance tests and sample tests. The former comprise the conductor resistance and voltage tests, as in previous editions, with a dielectric power-factor/voltage test for 33 kV cables only. Bending and drainage tests are specified for use when required as sample tests and the voltages to be applied after the bending test have been increased for working voltages up to 11 kV. A physical examination of the test sample after the bending test is now specified, with the intention of accumulating data for a future revision of the Standard. The bending test for aluminium sheathed cables requires two cycles of operations compared with three for lead sheathed cables. Test voltages for application after installation are the same for both types of cable.

Part II of the Standard applies only to cables with swaged seamless aluminium sheaths for working voltages up to and including 22 kV. Owing to the comparative hardness of the sheath, such cables are not generally required to be armoured but, for special conditions where armouring is considered necessary, dimensions are specified. Copies of the Standard are available from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1, price 6s for Part I, and 5s for Part II.

VIEWS on the NEWS

By REFLECTOR

SOMEHOW the idea has become prevalent in some quarters—and has not perhaps been discouraged by the rival fuel interests—that electricity is expensive to use. As with all forms of fuel it is, of course, possible to employ it wastefully, but I always find that my electricity bill (I have no gas supply) is invariably lower than the combined gas and electricity bills of comparable households. The electricity consumption of appliances such as vacuum cleaners, washing machines, irons, clocks, etc., for which electricity is in most cases the only possible choice, is so small as to be practically negligible, so that it is in the realm of cooking, space heating, and water heating that doubts as to the most economical fuel may exist. No one can call the generally recognized consumption of a unit per person per day excessive for cooking and more and more people are learning that for periods of up to six or even more hours a day it is cheapest to use electricity for warming their houses. With regard to water heating I personally am satisfied with a hot bath which costs me threepence. In all these reckonings I am, of course, taking no account of the savings in labour and the cost of decorations resulting from the use of a completely fumeless fuel.

* * *

Looking at the collection of sixty-year-old domestic appliances illustrated in the *Electrical Review* of 30th July I noticed that the Crompton cooker contained on an upper shelf a cake and a pie. Beneath them, presumably suspended from a hook in the shelf, was a joint of meat. The custom of hanging a joint in a cooker seems to have fallen into disuse, although I am sure it had advantages. It is, of course, a sort of vertical spit but without the rotating mechanism. I suppose such an arrangement could be provided—a small external motor with a shaft extension passing through the side of the oven to rotate the hook. The hob of this cooker looks like one overall hotplate; there are four utensils on it. I seem to recall seeing an early G.E.C. cooker equipped in this way. The idea was probably abandoned because it is frequently necessary to have unheated space on a hob for utensils it is not required to heat.

* * *

It seems to be the general practice of the Electricity Boards to close their showrooms or service centres on Saturday afternoon and from time to time there are protests from consumers. The point has cropped up again recently in the Southern and South Eastern Areas. At a meeting of the Southern Electricity Consultative Council, Group Capt. J. C. M. Hay reported that he had discussed Saturday opening with the Board and had been told that more business was done by remaining open on the general early closing day than could be done on Saturday afternoon. The Board claimed to have evidence of this. The South Eastern Consultative Council has submitted a proposal to the South Eastern Board that the East Grinstead showrooms should be open on Saturday afternoon on the ground that rural residents in the area would benefit. I should have thought that Saturday afternoon was generally a better time for business than the common early closing day when people tend to keep away from shopping areas. Nevertheless I am open to conviction to the contrary.

* * *

I have received a copy of an interesting little travel book, " Away to Sunshine," by Anna Iliffe (St. Catherine Press, 10s 6d). The name of the authoress will be familiar to many of my readers, for she is the wife of Mr. Alfred Iliffe of Benjamin Electric, Ltd. The book is an account of a holiday in Southern Italy and it makes good reading for a summer such as we have been experiencing. It is written in quite a conversational style and although it touches upon many " sights " and buildings of interest it avoids the guide-book manner. Mrs. Iliffe successfully conveys her interest and delight in what she saw and heard in one of the most scenic and historical areas of the world.

* * *

Artificial respiration methods are much the same whether the subject has been rescued from water or has sustained an electric shock. Consequently it is well to emphasize now and again that in either case efforts to revive the victim should be continued long after they appear to be hopeless. In a letter to *The Times* Sir Cecil Kisch quotes examples of success after hours of application and mentions a case, on the authority of the Royal Humane Society, in which recovery took place in hospital after eight hours' artificial respiration. The point was effectively put in a later letter from Mrs. Dorothea Oakley. She tells of a coastguards' class on resuscitation.

> " In the course of his lecture the senior coastguard asked the demonstrators at work on the ' body,' ' What do you do when a doctor has pronounced life to be extinct ? ' and received the answer, ' Pay no attention, sir, and carry on for another three hours.' "

* * *

The stroboscopic effect of a.c. lighting appears to have been introduced as a newly discovered phenomenon sixty years ago. In the *Electrical Review* of 17th August, 1894, there was published a photograph of a Ferranti dynamo in which the revolving field coils appeared to be at rest. The dynamo itself was actually supplying current to a.c. arc lamps in the station and thus, in effect, acted as its own stroboscope. Dealing with the phenomenon in the following issue Rankin Kennedy suggested its use for the examination of rotating machinery. He said :

> " Of course certain precautions would require to be taken to get the exact measurement, but it would be a valuable observation and lead directly to a method of observing the leads and lags in motor armatures under varying excitement. If photos were thus taken at various exciter powers from a synchronizing motor, the relative positions of the poles and coils could actually be seen; different loads and different excitements would give pictures showing different positions of the poles."

Earthing Faults on Installations

Legal Liabilities of Contractors and Electricity Boards

By C. F. MAYSON, A.M.I.E.E.

THE case of *Sellars* v. *Best and the North Eastern Electricity Board*,* recently heard by Mr. Justice Pearson at the York Assizes, raises some interesting points regarding the relative responsibilities of installation contractors and Electricity Boards when a fault on a consumer's installation results in injury or death to someone living in the consumer's house. The facts of that case were as follows:—

The first defendant, an electrical contractor, installed an electric water heater at the plaintiff's house and provided a new circuit by which it could be connected directly to the meter. An earth wire was run from the heater to a short earthing rod (about 18in long) which was buried in the soil outside the front door. Having completed the installation, the contractor applied to the Board for connection by means of the standard form which stated, " Please inspect and test." The Board connected the new circuit after certain tests which did not include one of the earth connection. About three months afterwards the plaintiff's wife received a fatal shock from the heater. It appeared that the insulation of the immersion element had broken down to the sheath, and the " earth " provided was of too high a resistance to allow the circuit fuse to rupture. It was shown in evidence that the earthing arrangement was adequate in wet weather only, and that the contractor had not tested for earth resistance.

Contractor's Obligation

In any contract for the supply or installation of something which is, or may become, potentially dangerous there is an implied term that the supplier or installer shall use reasonable care to ensure that that thing is safe. Thus, the contractor in this case was under a contractual obligation to see that the water heater was installed in a reasonable and proper manner, having regard to normal practice. Mr. Justice Pearson decided that he was liable to the plaintiff for breach of the implied term, in view of the I.E.E. Regulations and evidence of common practice in the district.

A contractual obligation does not extend beyond the parties to the contract, so that the first defendant was not, under that obligation, liable to the plaintiff's wife. But there is a rule of law that the person who does a negligent act owes a duty of care to those who ought to be within his contemplation as likely to be affected by it. In this case the duty would extend to all those permanently resident in the house who would be likely to come into contact with the water heater installation. There was no doubt that failure to provide a proper earth for the heater was a negligent act and therefore, as the learned Judge held, the contractor was liable in negligence to the unfortunate wife. It may seem anachronistic that such liability can extend to a person who is dead, but the law provides that certain rights of action survive for the benefit of a deceased person's estate, and the right to sue for damages for an injury which has resulted in death is one of those.

* (1954) 1 *Weekly Law Reports* 913.

The Board's liability might have been under the Electricity Supply Regulations, 1937, or under the same common law rule of negligence as that which caught the contractor. Both these possible liabilities were considered by Mr. Justice Pearson, but he decided, first, that the regulations afforded no cause of action either to the plaintiff or to the plaintiff's wife and, secondly, that the Board owed no duty of care to the latter in connection with defects on those parts of the installation over which it had no direct control. It is instructive to consider the learned Judge's reasons for this decision.

Position of Electricity Board

The obligation to give a supply of electricity is contained in Section 27 of the Schedule to the Electric Lighting (Clauses) Act, 1899. This obligation is subject to certain conditions contained in the section itself, and also to the provisions of the Electricity Supply Regulations, 1937. Reg. 25 (*a*) places responsibility upon the undertakers " for all electric lines and apparatus placed by them on the premises of a consumer and either belonging to the undertakers or under their control." That suggests that the undertakers have not the same responsibility for apparatus not in their ownership or under their control, and is an illustration of the principle that responsibility depends upon ownership and control.

Reg. 26 imposes a definite obligation in regard to leakage, and breach is an offence punishable with a penalty (Reg. 39). But Reg. 27 gives the undertakers a discretion, for they " shall not be compelled to commence or . . . continue to give a supply of energy " unless they are " reasonably satisfied " as to certain matters. That means that if the undertakers give a supply without being satisfied, they do not commit an offence, for there is nothing to say that an installation must be inspected or tested; power is given only to refuse a supply. It follows, therefore, that this regulation imposes no responsibility upon undertakers for any defects in consumers' installations. So, unless in a particular case the leakage figure at the time of connection is above that specified by Reg. 26, the Electricity Supply Regulations will afford no cause of action to a consumer (or his wife) who suffers such damage as occurred in this case.

It was alleged by the plaintiff that the Board should have tested the earthing system of the water heater, and it was argued that, because the standard form contained a request that it should " inspect and test " the new installation, there was a contractual obligation to the consumer to give a comprehensive test. But nowhere in the form was the nature of the test specified, the obligatory test being that for leakage under Reg. 26. It was further argued that the Board, in undertaking to make tests, misled consumers into thinking that they would be adequate to ensure against any unsafe feature of the installation tested. It was held that there was no ground for this assumption but, even had there been one, the obligation would have been purely contractual and would not have extended to anyone

other than the plaintiff himself, whom the Board regarded as its consumer.

The learned Judge, dealing with the question of common law negligence, concluded with these words:

> " The Board are responsible for bringing the electricity along their own lines, and for making and continuing to have, it may be, a proper connection at the terminal supply points. Then, if they have installed and they still have control of some electrical equipment on what is called the consumer's side, by virtue of that installation and continuing control they would be responsible for that also. It seems to me too much to say that the Board are responsible for what the occupier by himself and his contractors and agents may have done or omitted to do to his own chattels on his own premises."

For that reason his Lordship held that the Board was not liable in common law negligence either to the plaintiff or to his wife. The conclusion to be drawn from this case, and from others such as *Hartley* v. *Mayoh*,† is this. Unless the supply authority has itself done something wrong in connecting a consumer's installation to its mains (such as by crossing the phase and neutral leads between the meter and the main switch), it cannot be held responsible for any fault or defect on those parts of the installation over which it has no control, provided that it has carried out the statutory leakage test in conformity with Reg. 26. The installation contractor cannot hide behind any apparent undertaking by the authority to test his work, and it is for him to satisfy himself that he has done everything he should have done if he is to avoid liability for negligence.

† See " Dangerous Installations," C. F. Mayson, *Electrical Review*, 28th August, 1953, p. 453.

Steels for Steam Power Plant

Recent B.I.S.R.A. Studies in Collaboration with the E.R.A.

THE third annual survey which has just been published by the British Iron and Steel Research Association (B.I.S.R.A.) explains what an immensely detailed, time-consuming and expensive task is the development of steels for use in steam power plant. This makes it suitable for collaborative research and ever since its foundation in 1945 B.I.S.R.A. has co-operated closely with the Electrical Research Association on the subject, and the joint work has contributed materially to the improvement of efficiencies. Much of the detailed work is carried out at the National Physical Laboratory.

At present, for example, a thorough study is being made of the properties of the 2¼ per cent chromium, 1 per cent molybdenum steel, and of the 18 per cent chromium, 12 per cent nickel, 1 per cent niobium steel to be used in the latest plants. In particular, large numbers of creep tests over 10,000 hours (about 14 months) are made on specimens machined from actual superheater tubes and steam pipes. Similarly, additional examination of the variation in creep properties of different parts of a rotor is suitable for collaborative effort. In this examination, the creep properties in the circumferential, radial and axial directions of the centre and periphery of the forging are being examined.

Tests on bolts take a different form. Because they are held tightly in a fixed position during service they cannot deform. If they fail at all, they fail suddenly because of an increased stress which cannot find relief in deformation of the bolt. Consequently, a " relaxation " test is applied in which the length of the specimen is automatically maintained constant by decreasing the load when elongation tends to take place.

Scaling Problem

An important side of the work is concerned with the severity of scaling that can take place at high temperatures of 1,050 deg F and above, and which could cause premature failure. There has not so far been even a generally accepted method of testing the scaling resistance of different steels, though several firms have developed their own tests. Collaborative research has made it possible to lay down standard conditions of testing, and results from different works and laboratories can now be compared.

Scaling resistance can be given to a steel by the inclusion of 6 per cent to 8 per cent of chromium, but this reduces the all-important resistance to creep. It is becoming essential to understand the reasons for this in order to overcome it, and fundamental work on the nature of creep is assuming urgent practical importance. While work at the N.P.L. continues to explore the creep resistance specifically of the scale resistant steels, work undertaken for B.I.S.R.A. at Cambridge studies the effects of various carbide-forming elements and heat treatment on the precipitation of carbide in a 3 per cent chromium steel. This work has made it possible to study some of the precipitation phenomena under the electron microscope at magnifications of 60,000 times.

Further development of this technique may make it possible to reduce the amount of time-consuming creep testing required in connection with the introduction of new alloys, by enabling early elimination of unpromising combinations. There is a prospect of even further progress along these lines with the reflection electron microscope, fitted with a hot stage. If this innovation is successful, it will become possible to watch steel at very high magnifications while precipitation is taking place under actual working conditions of temperature and stress.

Industrial Engineers' Conference

A WEEK-END conference is to be held in London on Friday and Saturday, 29th and 30th October, on the subject of " Planning and Work Study applied to Plant Maintenance and Construction." This conference is being held because of the general interest which is developing in securing greater effectiveness and higher output from engineering and building staffs engaged on maintenance and construction in manufacturing undertakings and also as the result of the success of the one held at Roffey Park in April last. The conference will again provide an opportunity for engineers to discuss the problems of work study and incentives with men who have been employed on such methods with success for several years. It will also enable work study staffs who have specialized on the production side to enter into similar discussions.

Particulars and application forms for membership of the conference may be obtained from the Honorary Education Officer, Society of Industrial Engineers, 28, Victoria Street, London, S.W.1.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

THE United Kingdom Atomic Energy Authority announces the appointment of **Mr. K. L. Stretch** as works manager at Calder Hall, Sellafield, Cumberland, where Britain's first atomic power station is now under construction. Mr. Stretch, who will take up his appointment later in the year, is at present with the Salt Division of I.C.I., Ltd. He is an M.A., a barrister-at-law and an Associate Member of the Institutes of Civil, Mechanical and Electrical Engineers. Born in Antigua in 1917, he was educated at the Merchant Taylor's School, Crosby, and King's College, Cambridge. In 1939 he started his apprenticeship with Mather & Platt, Ltd., Manchester, but soon afterwards was commissioned in the Royal Artillery. In 1942 he was transferred to R.E.M.E. on wireless work. In 1946 Mr. Stretch returned to Mather & Platt to complete his training and worked in the Research Department. He joined I.C.I. in 1948 as instrument manager at the Hillhouse Works, near Blackpool, in the General Chemicals Division. In 1949 he became deputy works engineer at Hillhouse, and in December, 1951, transferred to Salt Division as design engineer.

Mr. K. L. Stretch

Mr. J. F. B. Jackson, B.Sc., A.R.I.C., F.I.M., is shortly to join the board of A.P.V.-Paramount, Ltd., as director in charge of the company's new Crawley foundries, producing castings in special steels and non-ferrous alloys. Mr. Jackson has relinquished his position as Director of the British Steel Castings Research Association to take up this new appointment.

Mr. G. Faraday Davies, M.I.E.E., whose retirement from the position of engineer of No. 4 Sub-Area, Merseyside and North Wales Electricity Board was reported in our last issue, is to be succeeded by **Mr. P. Blunt,** B.Sc. (Eng.), M.I.E.E., Assoc. I. Mech. E., the deputy sub-area engineer. Mr. Blunt held a number of appointments in the engineering departments of the Leicestershire & Warwickshire Electric Power Co., Ltd., the Mid-Lincolnshire Electric Supply Co. and the Newport (Mon.) Corporation Electricity Department. At vesting day he was mains engineer with the Wolverhampton Corporation Electricity Department. Six months later he became senior assistant engineer (planning) with the Midlands Electricity Board and he took up his present appointment in 1951.

Mr. P. Blunt

Mr. Oliver Lyttelton, who was recently created a viscount after resigning from the post of Colonial Secretary, was on 12th August re-elected to the board of Associated Electrical Industries, Ltd., and appointed chairman of the company, a position which he held from 1945 to 1951. **Sir George E. Bailey** has resigned the chairmanship but remains on the board. He is seventy-four and is chairman of the Metropolitan-Vickers Electrical Co., Ltd., and the Hotpoint Electrical Appliance Co., Ltd., deputy chairman of the British Thomson-Houston Co., Ltd., and a director of several other companies.

Mr. H. W. Wolff, B.Sc., A.M.I.E.E., A.R.T.C.S., has resigned his appointment with Dorman & Smith, Ltd., as chief engineer, research department, to form a new company. The principal object of the new concern is to manufacture miniature circuit breakers and appertaining gear.

Mr. H. W. Wolff

The Minister of Fuel and Power has re-appointed the following chairmen of Electricity Consultative Councils:—London, **Mr. I. J. Hayward;** Eastern, **Ald. W. J. Bennett;** East Midlands, **Mr. L. L. Perkins;** Merseyside and North Wales, **Mr. H. Evans;** Yorkshire, **Ald. W. Leach;** North Eastern, **Mr. W. S. Hall;** South East Scotland, **Mr. J. M. Airlie;** and South West Scotland, **Councillor J. D. Kelly.**

The B.B.C. announces the appointment of **Mr. E. P. B. Metcalfe** as engineer-in-charge of the new television transmitting station under construction at Rowridge, Isle of Wight, which will come into service on 12th November. Mr. Metcalfe joined the B.B.C. in 1936. Since May, 1953, he has been engineer-in-charge of the temporary television transmitting station at Truleigh Hill, near Brighton, which will close down when the Rowridge transmitter takes over the service.

It is announced that, for personal reasons, **Sir John Greaves** has decided to relinquish his position as managing director of Davey, Paxman & Co., Ltd., on 30th September next and will be retiring from the board, although he continues as a director of Ruston & Hornsby, Ltd. The directors have placed on record their appreciation of the valuable services rendered by Sir John during the five years he has been managing director of the company. **Mr. G. W. Bone,** assistant managing director, has been appointed to succeed Sir John as managing director.

Mr. F. D. Skinner has been appointed works director of the Bromley-Langton Electric Wire & Insulator Co., Ltd. He has been with the company since 1932.

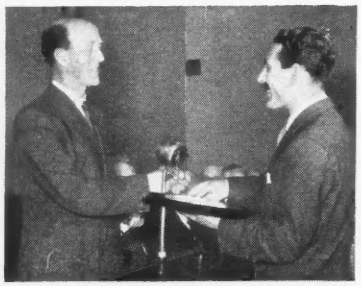
Everett, Edgcumbe & Co., Ltd., have appointed **Mr. P. S. M. McGreal** instrument applications engineer for the Midlands area.

Mr. J. M. Fleming, M.A., B.Sc. Tech., M.I.E.E., who joined the Micanite & Insulators Co., Ltd., in 1946 as chief development engineer and subsequently became director of research, has now been appointed chief engineer, in which capacity he assumes responsibility for the technical activities of the company.

Mr. J. M. Fleming

Mr. B. A. McNicholas, who has had twenty-one years' experience in the photographic ciné trade, has been appointed northern area sales representative for the British Victor Division of E. K. Cole, Ltd. His present address is: c/o the company's London office, 5, Vigo Street, W.1.

Mr. D. T. Jones, for many years with G. S. Peckham & Co., Ltd., latterly as general manager, is leaving the company on 30th September to take up a post with the Display Motor & Accessories Co., Ltd., of Stanmore.



The chairman of the London Electricity Board, Mr. H. J. Randall, presenting the shield and certificate to Mr. Harris on behalf of the Edgware Road Service Centre, the winners of the Board's 1954 window dressing competition (see p. 291)

Mr. G. Illingworth, borough lighting engineer, Southport, has been elected chairman of the Liverpool group of the Illuminating Engineering Society.

Mr. E. H. Ouston has resigned as an executive director and as joint secretary of the Plessey Co., Ltd. **Mr. W. F. Cross** will continue to act as secretary.

Mr. L. F. Walker, who has been secretary of the company for six years, and **Mr. D. C. Orders,** A.C.A., LL.B., have been appointed to the board of directors of Cimex-Fraser Tuson, Ltd.

Mr. William Tomlin has been elected a director of the Power Plant Co., Ltd.

The area final of the Norfolk and Suffolk Area of the **Electrical Industries Benevolent Association** National Golf Championship was held at Thetford Golf Club recently. The Windebank Cup was won by Mr. Goldsmith, Colchester, and the runner-up cup presented by Mr. C. T. Melling was won by Mr. Robertson, of the Eastern Electricity Board. The silver spoon for the best scratch score, presented by Mr. H. C. Waters, was won by Mr. E. O. Smith, also of the Eastern Electricity Board. The trophies were presented to the winners by Mr. C. T. Melling, chairman of the Eastern Electricity Board.

OBITUARY

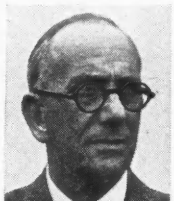
Mr. W. L. Barber.—The death occurred at Torquay on 9th August, after a short illness, of Mr. Walter Leonard Barber, who founded the Midland Electric Manufacturing Co., Ltd., and at the time of his death was chairman of the company. In 1908, with four colleagues, he launched M.E.M. in a small workshop at the back of domestic premises in Conybere Street, Birmingham, and specialized in the production of switchboards. Later larger premises were acquired in Rea Street and during the following years the business continued to expand and adjoining property was absorbed until the factory covered a large area between Rea Street and Barford Street. By 1936 a move was made to the present works in Reddings Lane where to-day 1,500 people are employed. In 1937 Mr. Barber had to leave the Midlands for health reasons and took up residence in Torquay. He was managing director at that time and, despite the distance, he continued to take a most active part in the management of the business. In 1942 he was appointed chairman of the company. He leaves a widow, a son (Mr. W. J. Barber) who is deputy managing director of M.E.M., and three daughters.

The Hon. James Russell Rea, Barrister-at-Law, secretary and legal adviser to the British Electrical and Allied Manufacturers' Association from 1936-1951, died suddenly last Monday at the age of fifty-one. He was the younger brother and heir-presumptive of Lord Rea, chief Liberal Whip in the House of Lords.

Mr. W. J. Orange, the English Electric Company's general manager for India, died in Calcutta on 2nd August at the age of fifty-three. Mr. Orange was apprenticed with the Lancashire Dynamo & Crypto, Ltd., and served the company for seventeen years, finally as manager for India and Burma. He joined the English Electric Co., Ltd., as general manager for India in 1935.

Mr. J. Stephen Souter, Associate I.E.E., a well-known engineer and pioneer in electrical matters in the North of Scotland, died on 11th August at his home in Elgin, Morayshire. Mr. Souter, who conducted an extensive business in Elgin until his retirement a few years ago, had several inventions to his credit.

Mr. H. Dixon, M.I.E.E., who until his retirement in 1949 was manager of the Central Sussex District of the South Eastern Electricity Board, died at Haywards Heath on 6th August at the age of seventy-two. He served an apprenticeship with McLennan & Co., Blackburn, and held positions with the Blackburn, Motherwell and Brechin undertakings before becoming Scottish manager for the Electric Supply Corporation, Ltd. From 1929 to vesting date he was chief engineer and joint general manager of Central Sussex Electricity, Ltd.



The late Mr. H. Dixon

Mr. D. S. Cargill.—The death occurred on 6th August, at the age of fifty-three, of Mr. Donald Stuart Cargill, London sales manager of Claude-General Neon Lights, Ltd. He joined the General Electric Co., Ltd., as a Witton apprentice in 1918 and on completing his apprenticeship served with the G.E.C. Newcastle sales engineering staff. In 1930 Mr. Cargill became associated with Claude-General Neon Lights and was responsible for the company's sales in the north-eastern area. He came to London in 1937 as provincial sales manager and held that position until 1953 when he was appointed London sales manager.

WILLS

Mr. R. O. Ackerley, M.I.E.E., F.I.E.S., a past-president of the Illuminating Engineering Society, who died on 22nd April, left £15,617 gross (£15,400 net).

Mr. G. G. Burford, M.I.E.E., M.Amer.I.E.E., deputy chief engineer to the Merseyside and North Wales Electricity Board, who died on 22nd March, left £6,617 gross, £6,533 net.

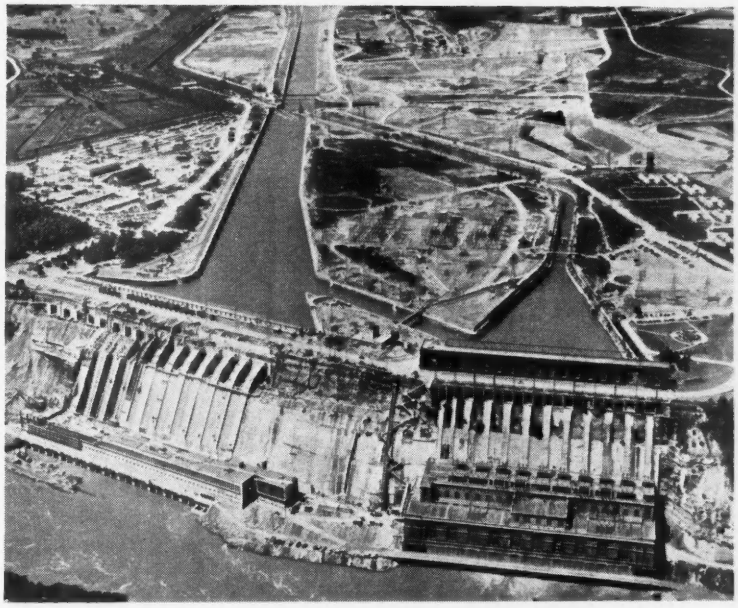
Technical College Courses

Copies of the 1954–55 prospectus of the Hackney Technical College, Dalston Lane, E.8, can now be obtained, free of charge, from the principal, and similarly that of the Poplar Technical College, Poplar High Street, E.14. The courses covered include electrical, mechanical, motor-car and marine engineering.

Courses arranged at the Sir John Cass College, Jewry Street, Aldgate, E.C.3, include one on "Scientific Principles of Fuel Technology" (Thursday evenings commencing 7th October). In the Department of Mathematics a course of lectures on "Electronics—Microwave Theory and its Applications, Part 1," is to be given by Mr. J. H. Collins, M.Sc., commencing Wednesday, 6th October, and a series of lectures forming Part 2 of the course by Mr. T. H. Walton, M.Sc., B.Sc., commencing Thursday, 7th October. A course of ten lectures on "Information Theory," with special reference to its applications in electronic communication and radar, is being given by Mr. C. L. Hamblin, M.A., B.Sc., beginning on Tuesday, 5th October. In the Department of Chemistry courses of lectures include "Statistical Methods in Scientific and Industrial Research" by Mr. A. J. Feuell, B.Sc., Ph.D., A.R.I.C., from Monday, 27th September; "Spectrochemical Analysis" by Mr. A. S. Nickelson, B.Sc., F.R.I.C., starting on Friday, 1st October; and "Radiochemistry and Radioactivity" by Mr. A. G. Maddock, M.A., Ph.D., A.R.C.S., D.I.C., commencing Tuesday, 5th October. In the Department of Physics a course of nine lectures on "The Quantum Theory of Molecules" is to be given by Mr. H. H. Greenwood, B.Sc., Ph.D., from Tuesday, 12th October.

"Floodlight," the London County Council's annual guide to evening classes, is now on sale in the bookshops, price sixpence. All branches of electrical and radio engineering are among over 500 subjects listed.

GENERATION AND DEVELOPMENT



The Sir Adam Beck hydro-electric station, Niagara

Niagara Station Inauguration

On 30th August the Duchess of Kent is formally to open the Sir Adam Beck station of the Hydro-Electric Power Commission of Ontario. The new station, with 1,828,000 h.p. of plant, has been built in the Lower Niagara Gorge adjoining the earlier plant which began operation in 1921 and can be seen on the right of the accompanying picture. Some details of the scheme were published in our issue of 18th December last.

St. Lawrence Project Started

The £214 million St. Lawrence seaway and power project was officially started last week at ceremonies at Massena, New York State, and Cornwall, Canada. In the presence of a party of about 3,000 Mr. Dewey, Governor of New York, set off a dynamite charge on Barnhart Island to turn the first earth. He read a message from President Eisenhower welcoming the project. The party then crossed to the Canadian side of the river where Mr. St. Laurent, Prime Minister of Canada, was the chief speaker.

Overhead Line Across River Avon

Contract engineers of W. T. Henley's Telegraph Works Co., Ltd., have carried out the construction of twelve miles of 132 kV double-circuit overhead line for the South Western Division of the B.E.A. This line runs from the new Portishead grid substation to a junction point at Winterbourne where it connects with the existing Filton line which Henley's constructed some years ago.

An interesting feature of the new line is the River Avon crossing for which straight-line steel towers having an overall height of 170ft carry the conductors at a height sufficient to clear the river traffic adequately. All the line supports are steel towers designed by J. L. Eve Construction Co., Ltd., to carry the 0·4 sq in (61/0·125) equivalent copper section, steel cored aluminium conductor. Additional work included the stringing of a second circuit of the Filton line with 0·4 sq in s.c.a. conductors and the dismantling of the 0·175 sq in s.c.a. conductors of the then existing circuit and their replacement by 0·4 sq in s.c.a. conductors. This line was originally designed for 0·4 sq in conductors, employing towers of Blaw-Knox design with reduced basic span to counter the additional loading imposed by the larger conductors.

Another item of additional work was the deviation of an existing 132 kV line to connect it into the new Portishead substation and the dismantling of the redundant section of the original line, which included a 290ft tower carrying the line over docks.

North Wales Water Power

It is reported that the British Electricity Authority proposes to promote a Bill in the next session of Parliament to authorize a hydro-electric development scheme on the River Rheidol, Cardiganshire, and the slopes of Plinlimmon, and a pumped storage scheme for Blaenau Festiniog. Local authorities are being approached with a view to meetings being held at which officials of the B.E.A. can explain details of the schemes. An earlier plan of development for the Rheidol was withdrawn two years ago and the original Blaenau Festiniog scheme has now been changed to provide for pumped storage.

Conon Valley Development

Loch Luichart power station, part of the North of Scotland Hydro-Electric Board's Conon Valley development, is to be officially started up by the Hon. Mrs. Ian M. Campbell on 3rd September. The six generating stations in the Conon Valley (Achanalt, Grudie Bridge, Glascarnoch, Luichart, Orrin and Torr Achilty) will have an installed capacity of 107 MW.

Staythorpe Inquiry

The Ministry of Fuel and Power has informed the Southwell Rural District Council that after consideration of the objections lodged against the proposed extension of Staythorpe power station the Minister has decided that a local inquiry shall be held.

Power Station Consent

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the building of the second half of Bold power station. The authorization covers the installation of

Straight-legged towers 170ft high support the span of the new 132 kV line crossing the River Avon

ELECTRICITY GENERATED AND PLANT INSTALLED*

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Installed capacity (m.c.r.) MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total†		
British Electricity Authority ...	2,618	74	6.8	4,854	27	4,888	4,576	19,044
N. of Scotland H.E.B.	14	1	0.9	22	59	84	83	578
Total for July, 1954	2,632	75	7.7	4,876	86	4,972	4,659	19,622
Corres. total for July, 1953 ...	2,441	63	6.7	4,403	74	4,489	4,210	18,075
Increase or decrease, per cent ...	+7.8	+19.0	+14.9	+10.7	+16.2	+10.8	+10.7	+8.6
Total to date (7 months), 1954...	22,226	664	81.6	40,799	787	41,670	39,177	
Total for corres. 7 months of 1953	20,593	538	47.2	36,954	594	37,644	35,417	
Increase or decrease, per cent ...	+7.9	+23.4	+72.9	+10.4	+32.5	+10.7	+10.6	

* Comprising all generating stations controlled by the British Electricity Authority and the North of Scotland Hydro-Electric Board.
† Including 6 million kWh generated by oil engines and 4 million by waste heat plants in July, 1954.

three 60 MW generating sets, each served by a boiler with an evaporative steam capacity of 550,000 lb/hr, and the building of three cooling towers each having a capacity of 2,250,000 gal/hr. When completed the station will have a total installed capacity of 300 MW.

Generation in July

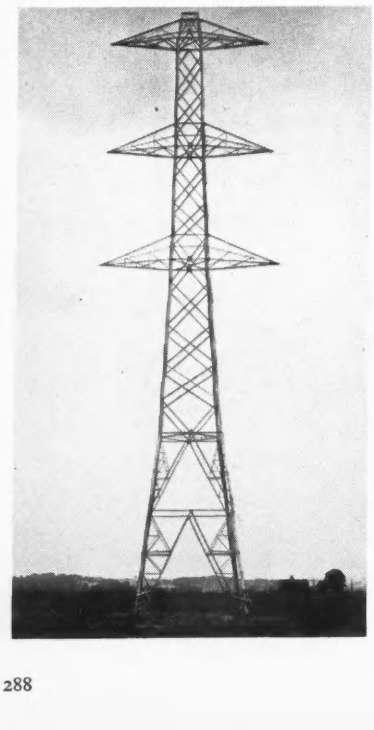
Last month 4,972 million kWh was generated by the British Electricity Authority and the North of Scotland Hydro-Electric Board, 483 million kWh more than in July, 1953. This brings the total for the first seven months of the year to 41,670 million kWh, which compares with 37,644 million kWh in the corresponding period of 1953. At the end of July the total installed capacity was 19,622 MW, representing an increase of 102 MW during the month.

New plant put into commission in July included a 360,000 lb/hour Babcock & Wilcox boiler at Carrington power station, a 60 MW English Electric set, and a 515,000 lb/hour International Combustion boiler at Stourport and a 30 MW G.E.C. set at Doncaster.

Supergrid Tower

The accompanying illustration shows the first tower to be erected for the British Electricity Authority's 275 kV double-circuit line between Staythorpe and Drakelow. This line, which forms part of the 275 kV super grid scheme, is 47¼ miles long, and installation is being carried out by the Contract Department engineers of W. T. Henley's Telegraph Works Co., Ltd. The consulting engineers are Messrs. Merz & McLellan.

One of the towers of the Staythorpe–Drakelow 275 kV line



Portuguese Schemes Accelerated

There has been a considerable speeding-up of work on hydro-electric schemes being carried out in Portugal under the Government's development plan. The Cabril project, which was scheduled to begin operations in 1955, is already running experimentally—it has cost 500 million escudos and will have an annual output of 270 million kWh. The Canicada project, which was also due for completion next year, will be working this year and will add some 200 million kWh to the nation's power supply. The Bouca power station, which will complete the project for the harnessing of the Zezere, is making rapid progress and will begin production in the second half of next year. In the first three years of the development plan the following important hydro-electric schemes will have been completed (annual output in million of kWh in brackets): Salamonde (120); Cabril (270); Canicada (200); Bouca (135); Increase of output in other centres (80). The total production increase thus aggregates 805 million kWh.

Electricity in the Hebrides

An electricity supply is to be switched on at Tarbert, on the island of Harris, in the Outer Hebrides, on Monday next. The supply is being provided by land line from Stornoway, 35 miles away.

South Angus Distribution Scheme

Work is expected to start before the end of the year on the North of Scotland Hydro-Electric Board's South Angus distribution scheme. The proposals, estimated to cost £190,000, cover rural supplies in an area bounded by a line from Dundee along the coast to Arbroath, north to Friockheim, west through Forfar to Newtyle and back to Dundee.

Station Superintendents' Salaries

A CLAIM for additional payments for five power station superintendents in the B.E.A. South Eastern Division who are each in charge of two stations was the subject of a recent Industrial Court award.

The Electrical Power Engineers' Association contended that the added responsibility was greater than if an equal amount of generating plant was installed in one station. By placing the ten stations under the control of five superintendents the B.E.A. saved £3,792 per annum of which the Association's claim, if conceded in full, would absorb only £656, allowing plus payments ranging from £211 to £61. It was pointed out that on the classification basis the station superintendent at Hastings could be called upon to accept responsibility for the Eastbourne station without any increase in salary, although a superintendent at Eastbourne would be entitled to a salary of £857.

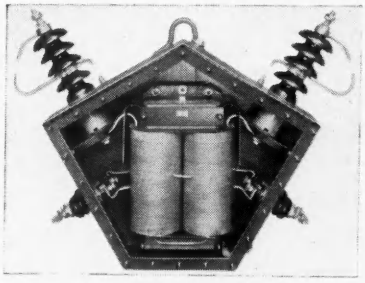
On behalf of the Electricity Boards' members it was stated that the basic principles of grading and classification had existed in the N.J.B. Agreement since 1920. The classification element had been accepted as a rough measure of the difference in duties and responsibilities arising from the difference in "size"; it had never been claimed to be an exact measure. The Association had accepted the principle of aggregated capacity classification without further plus payment in the case of maintenance engineers and chemists required to exercise responsibility over more than one power station and it had also been accepted without question in the case of superintendents in charge of two or more stations on one site. Attention was also drawn to other cases of superintendents in charge of stations some miles apart. The Boards' members had been unable to find any logical formula which would justify the amounts claimed. It was considered that such claims were domestic in character and should be settled within the industry and as a gesture to this end an offer of £50 in each case was made. At a meeting last March the Association indicated that if the claim was to be settled on the basis of equal plus payments irrespective of the varying circumstances it could not accept less than £100. This the Boards' members felt to be out of all proportion to any extra responsibilities carried which, in their view, were already covered by the Agreement.

The award of the Court was that the five superintendents should be paid a further sum of £50 per annum from the dates when they assumed their additional responsibilities. It was noted that the aggregate megawatt classification gave no additional salary to the superintendent of the Hastings station who was now required to accept responsibility for the Eastbourne station. The Boards' members stated that in their view an anomaly such as this could only be dealt with in the District, and in the light of this the Court suggested that further consideration should be given to this case.

NEW ELECTRICAL EQUIPMENT

Rural Type Transformers

The new single-phase pole-mounting type transformers now in production at the B.E.T. Works of CROMPTON PARKINSON, LTD., Crompton House, Aldwych, London, W.C.2, have been specially developed to meet the latest requirements of rural electrification schemes. The range covers 5, 10 and 15 kVA sizes for



5 kVA rural type transformer with cover removed

6·6 and 11 kV service, and it is understood that the transformers have already met with a favourable reception from Area Boards.

The pentagonal style of tank employed has an attractive appearance and is so designed that the bushing terminals converge on the windings, thus eliminating long connections and thereby removing potential sources of weakness. Of strong construction throughout, it has a removable front cover giving ready access to the windings for servicing.

The standard ratios provided cater for either 6·6 kV/250 V or 11 kV/250 V. Voltage adjustment tappings are provided at ± 5 per cent to accept high voltage variations or to provide a selection of low voltages, but tappings can be arranged for other percentages if specified.

Designed on the same principles as larger units, these new rural type transformers have tappings that are arranged about the magnetic centres of the windings, this arrangement reducing to a minimum the resultant out-of-balance forces that might occur in the event of an external short-circuit. Tappings are brought out to external terminals, thus obviating the need for removal of tank covers when selecting ratios. The transformers are arranged for single bolt fixing, and fittings supplied as standard include h.v. and l.v. terminals, "Duplex" arcing horns on h.v. terminals, a plain breather and an earthing terminal. Optional extras include an oil gauge, a drain pipe and a thermometer pocket.

Electroluminescent Panels

A range of electroluminescent panels is now being made by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, to provide "silhouette" illumination of clock faces, diagrams, and signs in places such as photographic dark rooms. The colour of the light emitted is dependent only on the luminescent materials employed, so that coloured filters are not normally required. The panels are also suitable for displaying certain signs in cinemas, theatres, lecture halls and other public buildings where notices have to be made visible in a darkened auditorium.

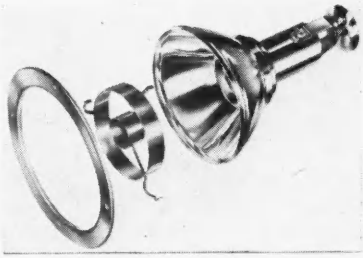
Four standard sizes of panel, up to 8in square, are being produced, giving light of a colour known as "panchromatic green." This colour corresponds to a region of low sensitivity for panchromatic emulsions, and at a given brightness level there is no risk of films being "fogged."

Panel brightness varies with the frequency and voltage of the supply, and a simple potentiometer circuit may therefore be used, if necessary, to give a convenient control of the brightness level. The panels at present available are designed for operation at 200/260 V a.c. only, at 50 c/s. Power consumption is of the order of one or two watts, and it is interesting to note that a similar powder fluorescence excited by ultra-violet radiation would require a lamp power of about 100 W.

Shop Window Lighting

A versatile fitting for both floodlighting and spotlighting merchandise in shop windows and interiors has been developed by SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38/39, Upper Thames Street, London, E.C.4. Constructed of heavy gauge aluminium, it consists of a ventilated gallery and a specially processed reflector which permanently retains a high reflective quality. It is provided with a focusing device for producing a spotlight or general flood, and adjustable mounting is achieved by means of a stirrup bracket assembly.

A matt black-finished circular louvre, equipped with spring clips for easy fitting and removal, and a soffit ring to allow recessing of the fitting into a false ceiling are available as extras. The fitting is designed for use with 100 or 150 W tungsten filament lamps and is provided with a b.c. skirted lampholder. The price is 39s 6d, the louvre and soffit ring costing 9s and 8s 6d extra respectively.

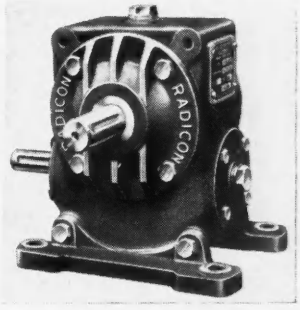


Siemens shop window lighting fitting with louvre and soffit ring

Addison cable diameter recording gauge

Worm Reducer Unit

An extension of their range of "Radicon" worm reducers to include a size 2¼ unit, capable of transmitting drives from 0·20 to 3·55 h.p., is announced by DAVID BROWN GEARS (LONDON), LTD., Stonebridge Park Works, London, N.W.10.



"Radicon" worm reducer unit

Fitted with detachable feet, the new model will operate in any one of 24 mounting positions and an extensive choice of ratios is offered, ranging from 5·25 : 1 to 60 : 1. Typical drives for which the units are suitable include small pumps, electrical controllers, small machine tools, conveyors, textile machinery, stirrers and agitators. Other "Radicon" worm reducers are the 1⅛ and 1⅜ units, designed for drives up to approximately 1 h.p.

Cable Diameter Gauge

A new equipment which forms part of the company's range of cable diameter gauges and automatic controllers has been introduced by the ADDISON ELECTRIC CO., LTD., 10/12, Bosworth Road, London, W.10. It consists of a gauge head incorporating a magnetic detector which is mounted in the line of a cable during manufacture. This gauge head is connected to the instrument cabinet as shown in the accompanying photograph. The equipment provides a continuous record on a linear paper chart of the deviations of the cable diameter from the nominal value.

The normal sensitivity of the instrument is ± 0·005in full scale deflection. When used in the production of extruded metal sections, strips or cable cores, etc., the sensitivity is raised to full scale deflection of ± 0·001in. Among other applications, instruments of this type are now being used in the manufacture of the core of the new transatlantic telephone cable.

The recording equipment can also be used in conjunction with "Addison" cable diameter controllers for the automatic maintenance of the size of extruded cables.

INDUSTRIAL NEWS

Engineering Wages

A new wages structure incorporating substantial pay increases for all grades in the industry is to be sought by the Confederation of Shipbuilding and Engineering Unions, which comprises 39 unions. This was decided last week at the Confederation's annual conference at Brighton. The Executive Council was instructed to open immediate negotiations with the Engineering and Allied Employers' National Federation.

Big Russian Contracts for Britain

Crompton Parkinson, Ltd., announce the successful completion of negotiations with Raznoimport, Moscow, for two contracts for paper insulated cable and wire (for transportation purposes). Deliveries will be spread over a period of six months and the total value of the orders will amount to about £1,700,000.

Great Yorkshire Show

About 82,000 people paid for admission to the Great Yorkshire Show which was held at Harrogate last month. Harrogate is situated in the North Eastern Electricity Board's area, but as the Yorkshire Electricity Board's area is quite close a combined exhibit was arranged. The agricultural exhibits were under the direction of Mr. H. D. Phelps, agricultural engineer, N.E.E.B., while Mr. J. Hack, agricultural engineer, Y.E.B., was responsible for the domestic exhibits. Included in the display were a large fitting shop equipped with portable and fixed tools; a byre; two dairies, one a parlour type and the other suitable for a farm using bucket type milking plant; and poultry, horticultural and domestic sections. A large barn was devoted to electrical barn equipment. The centre or open portion of the stand catered for the requirements of the pig keeper, two sties illustrating the use of electrically warmed floors and infra-red lamps. The general farmer was shown a hand-operated turnip chopper and potato grader converted to electric drive, while a two-wheel 2ft 6in drum portable threshing machine was shown working in conjunction with a "shaker" or "jigger" conveyor.

Outside, a pole-mounted 25 kVA, 11 kV/480–240 V single-phase transformer mounted at one-third the normal height, together with a short length of l.v. 3-wire network and a service, illustrated the equipment and work necessary to afford a low voltage supply from a high voltage overhead line.

Compensation for Injury

A linesman's mate in the employ of the South Western Electricity Board, Mr. S. Sullivan, of Hayle, has been awarded £8,000 compensation out of court for a severely damaged eye. He received the injury in May of last year when a length of wire struck his eye after it had been cut.

The Royal Yacht "Britannia"

Referring to the article on H.M. Yacht *Britannia* in our issue of 30th July, Metal Industries, Ltd., inform us that their subsidiary, Brookhirst Switchgear, Ltd., supplied the control gear for the engine room auxiliaries, for the fire protection system and for the watertight doors.

Machine Tool Showrooms

With the object of providing a comprehensive display, on exhibition lines, of most types of machine tools, both new and second-hand, M. C. Layton, Ltd., the machine tool distributors, have opened new showrooms at Abbey Wharf, Mount Pleasant, Alperton. In addition to offices and reception rooms, an uninterrupted area of nearly 9,000 sq ft is available for display purposes and facilities are provided so that every machine on view can be demonstrated. Demonstrations of special machines are to be a regular feature.

Portion of the North Eastern Electricity Board's stand at the Great Yorkshire Show, including threshing machine, stacker and pneumatic conveyors, pig pens, etc.

Tunisian Quotas for British Goods

Among goods for which sterling allocations have been made available for imports into Tunisia during the second half of 1954 are electrical household appliances and radio sets.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £156 0s 0d
COPPER, H.C. Electro	ton £235 5s 0d
Fire Refined 99·70%	ton £234 0s 0d
Fire Refined 99·50%	ton £233 0s 0d
COPPER Tubes ..	lb 2s 3⅜d
Sheet	ton £295 15s 0d
H.C. wire and strip ..	ton £264 5s 0d
LEAD, English ..	ton £96 15s 0d
Foreign	ton £95 0s 0d
MERCURY	flask £100 0s 0d
TIN, block (English) ..	ton £727 0s 0d
ZINC, G.O.B. Foreign	ton £74 15s 0d
Electrolytic	ton £81 15s 0d
BRASS Tubes (solid drawn)	lb 1s 10½d
Sheet	ton £242 5s 0d
Wire	lb 2s 6d
PHOSPHOR BRONZE Wire	lb 3s 9½d
PLATINUM	oz £30 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 20d–20⅛d

Kidbrooke School

With regard to the article on the Kidbrooke School which appeared in our issue of 13th August, Siemens Electric Lamps & Supplies, Ltd., informs us that its electric lamps are being used throughout. Under a contract held by the company for thirty or so years its lamps are specified for all London County Council buildings, including schools, flats, libraries, offices and all public premises.

Display Pack

"Ediswan Bijou" adaptors are now being supplied in a new type carton specially designed for counter or window display. The carton, which contains a dozen individually boxed adaptors, is printed in "Ediswan" standard house colours of red, blue and black.

The window display of the Edgware Road Service Centre which was awarded first place in this year's window dressing competition of the London Electricity Board

London Window Dressing Competition

The London Electricity Board held its fourth annual window dressing competition, open to members of all Service Centre staffs, in March and early April this year. Some fifty entries were received. A preliminary judging panel of senior officers of the Board selected twelve entries for submission to the final judging panel (Mr. C. Crawford, chairman, London Branch, British Display Association, and Mr. A. J. Symes, editor, *Display, Design and Presentation*), who made the following awards:—First: Edgware Road Service Centre (" Piping Hot Water for Sparkling Dishes, Brilliant Whites, Without Hot Fires "). Second: Eltham Service Centre (" Why Get Tired, Electricity Doesn't "). Third: Walthamstow Service Centre (" How To Do Housework Without Fatigue—Use Electricity ").

At the St. Pancras Town Hall on 23rd July the shield and certificates were presented to the winners by Mr. H. J. Randall, C.B.E., F.C.I.S. Companion I.E.E., chairman of the Board. Messrs. Crawford and Symes gave a review of the displays, emphasizing the points on which marks had been awarded, and answered questions submitted by members of the staff. They remarked upon the very high quality of the entries this year.

Trade with Mexico

Although dominated by the United States, Mexico is stated, in an article written for the *Board of Trade Journal* by the Commercial Section of the British Embassy in Mexico City, to be a valuable hard-currency market for United Kingdom exporters. There is said to be a good market for electric cables, power line transmission equipment, boilers, generating plant, motors, transformers, telephone and telegraph equipment, electrical contacts, rheostats and radio and television spares. Some market exists for accumulators and car batteries, small electrical kitchen equipment, record players and radio transmitters. If local manufacture, part manufacture, assembly or packing is arranged, there may also be a good market for refrigerators, washing machines, water heaters, cookers, radio and television receivers.

Development in N.E. Lancs

The Barnoldswick, Earby and Salterforth Joint Industrial Development Committee has prepared an illustrated brochure setting forth the facilities available in the North East Lancashire development area. Copies are available from Mr. Robert W. Fenton, clerk of the Committee.

Indian Lamp Standardization

The Indian Standards Institution has issued a standard for general lighting service electric lamps prescribing three voltages—110, 230 and 250—for wattages from 15 to 500. Technical requirements and methods of testing are laid down for single-coil or coiled-coil clear and pearl lamps, with either bayonet or e.s. caps. The standard life is put at 1,000 hours and average efficiency is defined as the efficiency after 500 hours' operation.

The Institution is investigating the possibility of deterioration during storage of the cement fixing the cap to the bulb and whether there is a need for a repetition of the torsion test after storage.

Decorated Vehicle

A decorated vehicle entered by the North Western Electricity Board No. 4 Sub Area in a procession organized by the Bispham and Norbreck Gala Committee recently, was placed first in Class 2, " Neatest and Cleanest Tradesmen Turn Out," and Class 3, " Most Attractive Tableau or Model." The display was viewed by many thousands of Blackpool residents and holiday-makers during one of the busiest weeks of the holiday season.

International Scientific Film Congress

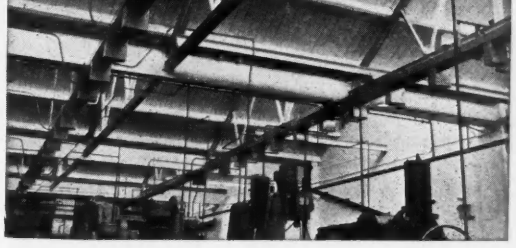
The eighth annual congress and festival of scientific films of the International Scientific Film Association will take place from 6th to 12th November at the University City and National Research Council, Rome. Inquiries should be sent to the Scientific Film Association, 164, Shaftesbury Avenue, London, W.C.2.

Works Busbar Distribution

Special circumstances affecting a machine shop at the Adderley Park Works of Morris Commercial Cars, Ltd., have made it necessary to provide for maximum flexibility in the type of machines used and their layout in the shop, and consequently an overhead busbar trunking system has been installed. The trunking, supplied by the General Electric Co., Ltd., enables three-phase power to the machines to be tapped off at 3ft intervals through vertical units with h.r.c. fuses attached to the underside of the trunking. Fingers with heavy contacts reinforced by steel springs maintain a high-pressure grip on the busbars so that the single operation of mounting the unit on the trunking simultaneously makes the electrical connections. Unused outlets are protected by covers.

The busbar system is fed by two 440 V, three-phase feeders, each terminating in the 600 A busbar chamber of a G.E.C. ironclad switchboard which comprises one 500 A t.p. main fuse switch, and three 300 A t.p. fuse

Busbar trunking and tap-off units at the Adderley Park Works of Morris Commercial Cars



Eastern Electricity Board mobile service centre in use at the Hunts County Show

switches controlling groups of trunking runs. Both switchboards are mounted in the roof of the shop. From the main switch units the feed to the busbar trunking is made by cable brought into each run at a central point, giving double capacity, and then looped to two or three adjacent runs, thus providing flexibility in grouping machines. Some 500 tap-off units are in use.

Mobile Service Centre

A mobile service centre recently put into operation in the Eastern Electricity Board's Fens Sub-Area consists of a caravan 22ft long by 7ft 8in wide mounted on a single axle chassis and towed by a "Land Rover." The internal arrangements include a cold water supply tank feeding a u.d.b. water heater, which in turn supplies a sink unit. A removable display counter and cash desk is exchangeable for a demonstration table, and there is ample space for the display of one each of the major domestic appliances, together with a selection of the smaller items. Lighting is by fluorescent tubes. An adequate wiring installation controlled by a main switch in a cupboard draws its supplies from either a 12 V battery or from the Board's mains via a trailer cable. There is sufficient seating capacity for 12–15 persons for demonstration purposes.

Electricity in India

With its 15th July issue *The Hindu* (Madras) published a 24-page Electricity Supplement. It included articles on many aspects of power generation, supply and use in India. Among the articles was one on cable and transformer manufacture, one on the simplification of rural distribution systems and another on power generation in South India. A number of very good illustrations of hydro-electric and other schemes appeared in the supplement.

British N. Greenland Expedition

Power for the British North Greenland Expedition, members of which have recently returned to this country, was provided by a Petter AV1 water-cooled diesel generator set which was used for lighting and communication. Originally, two AV1 sets were provided, but one of these was lost when a lighter transporting equipment across Britannia Lake capsized during a squall. For two months of total darkness the single AV1 set bore the entire lighting load for periods of as long as 20 hours each day. A 50 gallon water tank was installed for cooling and it was necessary to keep the ambient temperature of the generator room up to as near freezing point as possible. When the engine was not running a paraffin stove was used for heating. There was never any trouble with starting by hand; even at the lowest temperature within the generator room (−12 deg F) the flame starting aid was never used, nor were the battery starters.

In addition, an AVA type air-cooled diesel engine supplied by Petters was used in an unheated annexe to the generator room to keep starting temperatures down to −40 deg F and much useful information was obtained on the operation for long periods of air-cooled diesel engines under severe conditions.

"Queen of Light" Competition

Nineteen British girls chosen from all over Britain are to take part in the final of the B.T.H. "Mazda Queen of Light" competition to be held in London on 21st December, when the winner will be enthroned as the national "Queen of Light." The nineteen finalists will be drawn from heats held in towns throughout the country organized by Mecca Dancing. The first contest took place yesterday (Thursday) at the Harbour Band Arena, Morecambe.

Institution of Production Engineers

The Institution of Production Engineers has moved to 10, Chesterfield Street, London, W.1 (telephone: Grosvenor 5254/9).

Catalogues and Lists

Automatic Telephone & Electric Co., Ltd., Strowger Works, Liverpool, 7.—Illustrated catalogue of "Strowger" private automatic telephone exchanges.

A. H. Hunt (Capacitors), Ltd., Wandsworth, S.W.18.—Leaflet on foil and paper capacitors for capacitor motors (CL 548) and a leaflet on capacitors for power factor improvement (CL 542R).

Micromatic, Ltd., Wootton Mount, Old Christchurch Road, Bournemouth.—Leaflet and price list describing "Meico" fluorescent lighting units and fittings.

Enthoven Solders, Ltd., Enthoven House, 89, Upper Thames Street, London, E.C.4.—Catalogue of the company's solder products.

Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.—The 1954–55 edition of "Perfection in a Flash," containing technical information on the use of "Photoflux" flash bulbs.

The Concordia Electric Wire & Cable Co., Ltd., Long Eaton, Nottingham.—Two leaflets dealing with cables and flexibles and winding wires (451) and "Polyflux" quick-soldering enamelled copper wire (254).

Quasi-Arc Co., Ltd., Bilston, Staffs.—Illustrated technical circular describing the company's MR.375 d.c. arc-welding rectifier (T.C.898).

Frank Whitelegg, Ltd., 304, High Street, Sutton.—Three leaflets on armature winding machines, coil taping machines and coil holders for wire and strip.

A.C.E.C., 56, Victoria Street, London, S.W.1. — Illustrated 36-page catalogue dealing with underground electric traction (3/2172).

Trade Announcements

The directors of **Permali, Ltd.,** announce that, subject to the necessary consents being obtained, a merger has been arranged between the company and **Hordern - Richmond, Ltd.,** manufacturers of Hydulignum, whose chairman, Mr. Lawrence Robson, will join the board of Permali, Ltd.

The address of the **Kersons Manufacturing Co., Ltd.,** is now Wayland Works, King's Road, Tyseley, Birmingham, 11 (telephone: Acocks Green 0616–8).

Metal Industries, Ltd., has moved to Universal House, 60–62, Buckingham Palace Road, London, S.W.1 (telephone: Sloane 5587, 5814 and 5618).

The Ductube Co., Ltd., has moved to 1, Adelaide Street, London, W.C.2 (telephone: Covent Garden 1156–7–8).

Remploy, Ltd., the Government sponsored organization set up following the passing of the Disabled Persons (Employment) Act in 1944, has obtained full manufacturing and selling rights in this country and all foreign countries excluding the United States and its possessions for the tubular elements manufactured by the Stillman Co. of New York. These elements are specially constructed for the electrical heating of oil, water and chemical solutions and for operation in free air and are made to customers' specifications.

Tiltman Langley Laboratories, Ltd., research and development engineers, of Redhill, Surrey, have acquired a majority of the ordinary shares and most of the preference capital of Mid-Century Engineering, Ltd., Cranleigh. This will enable Tiltman Langley to increase their production to deal with several large new contracts and others now being negotiated.

Dry Shaver Manufacture

Large-Scale Production in a Scottish Factory

Packing a "60" shaver

ELECTRIC shaving has long since passed the stage of being a novelty and if there are those who are still sceptical of its efficiency they cannot have experienced the convenience, high speed operation and other advantages of the latest types of apparatus. Nevertheless the vast potential market for dry shavers still remains largely untouched, despite the manufacture of many thousands of these appliances a week by the dozen or so firms now in large-scale production.

We recently paid a visit to the Hillington Industrial Estate, Glasgow, to see how one of the largest manufacturers in the country, Remington Rand, Ltd., is meeting the increasing demand. Commencing manufacture in this country about six years ago this company has doubled its output in the past twelve months, and reorganizations are always in hand with a view to further expansion of production. Incidentally improvements in manufacturing technique have quadrupled productivity since the factory was first opened.

The factory undertakes the complete manufacture of the shavers and is independent of its American parent company for supplies of components. Only a few items such as the plugs and flexible cords are not made on the premises.

Production is being concentrated on the new model "60" which was introduced last autumn. The "hand-fitting" shape of this shaver offers many advantages in regard to comfort of grip and ease of manipulation. As on previous models, the shaving heads are conveniently designed to follow the contours of the face. The two extra-long twin shaving heads house 132 super-honed cutters, each operating at a speed of 16,000–19,000 strokes per minute. The whole weight of the shaver is only 10½ oz; though rated at 15 W its loading does not normally exceed 10 W.

Blanks for the head shell are stamped out of carbon steel strip in two operations on presses operating at a speed of 150/min. Two further press operations form slots down the middle and then bend the heads to the required shape. The cutters are produced similarly, eventually being formed into units with a rectangular cross section. Pairs of cutters are mounted on headplates blanked out in one operation and the heads and cutters are made the same length by grinding. Forming completed, both heads and cutters go to the hardening plant with an operating temperature around 1,000 deg C.

A good example of the beneficial effect of time and motion study on production is to be seen in team work employed in the uniting of the head shells with the base spacers previously blanked out. Synchronized action enables one operator to load and unload the components on to the jig in the same time as it takes for another operator to perform the actual welding.

Sharpening of the cutters is performed on three-head rotary honing machines, each head accommodating eighty-four cutters at a time. The insides of the head shells are dealt with eighteen at a time by means of machines giving a backwards and forwards motion. After honing, the heads and cutters are washed, degreased and dried and then vapour blasted to produce a satin finish. Further

Left: Forming the cutters of the shavers. Right: Producing the oscillators which operate the cutters

cleaning by means of the reversed current electrolytic process precedes plating which involves successive treatment in baths of water, sulphuric acid, water, chrome and hot and cold water. After drying off in oil vapour the units are examined under microscopes. In the subsequent assembly of the heads to the headplates ball bearings are inserted, the springs are fitted and locked in position and the decorative blue lines are painted on the heads.

Meanwhile in another department the high-speed motors are built up. The stator and rotor laminations are stamped out and assembled by riveting, those for the rotors together with brass starting discs.

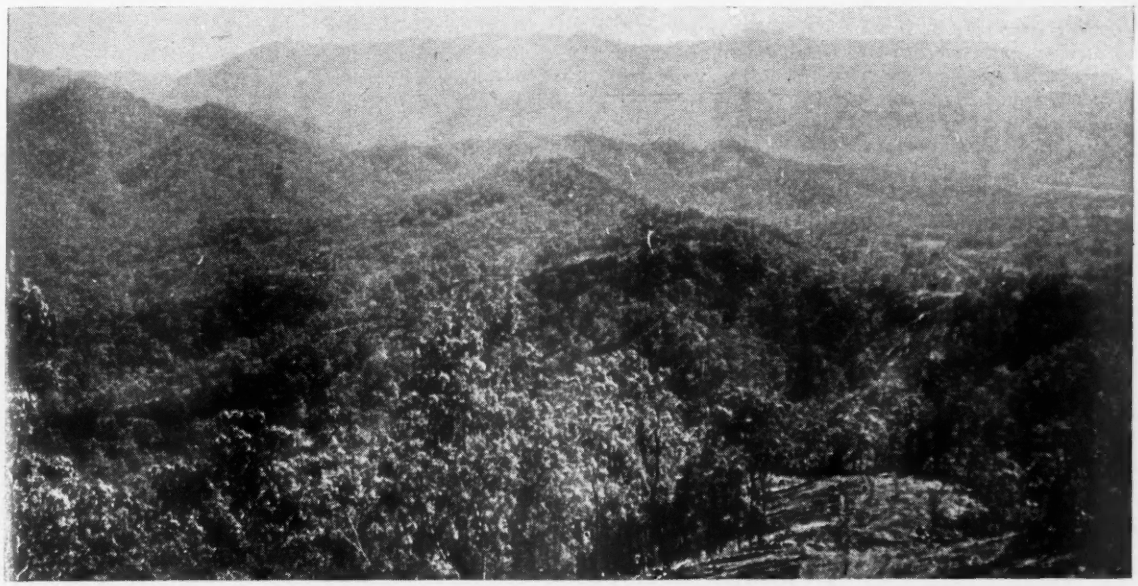
In the winding section nylon spools coloured in accordance with the voltage are first fitted to the stator cores before they are wound with magnet wire. The coil insulation is then added and the fine wire ends are reinforced before lapping with tape. The condenser for radio interference suppression is made up ready for connection and the spark suppression condenser and resistors are also inserted together with the terminal assembly and the Bakelite bearing plates, complete with oscillator for the cutters. The actual bearings are of a special composition developed for long life in high speed shaver operations.

The eccentrics which convert the rotary action of the rotor to an oscillating motion for operating the cutters are passed through a centreless grinder before being spun on and riveted to the rotor shafts, which are machined, case hardened and honed. The rotors themselves are ground to the correct outside diameter.

The driving arms are welded on the oscillators which drive the cutters and, after hardening and plating, have nylon insulation added as a safety precaution between shaft and the heads. The thickness of the nylon is checked and the oscillators are fitted to the eccentrics. End play on the rotor shafts is checked to very close limits. After a rough adjustment of contacts the motors are given a twenty minute run at 11,500 r.p.m. and marked with a date stamp before going into the finished components stores.

Successive operations in the final assembly of the shavers comprise the fitting of the motors into the cases, oiling, adjustment of contacts, fitting starting wheels and springs for holding the head plates, sealing joints to prevent ingress of hair, fixing and tightening screws, fitting the heads (kept until required in airtight boxes), running test for checking speed and current consumption, and giving a final polish. After packing in their cases with cords and operating instructions the shavers are ready for dispatch.

Top: Inspecting heads for contact. Centre: Checking motor performance. Below: Part of plating department



Overhead Lines in Queensland

Construction Work in Difficult Country

By J. RITCHIE*

THE State Electricity Commission of Queensland, instituted in January, 1938, is required by its charter to "ensure the safety of the public, to secure a proper and efficient supply of electricity, to regulate and control the price of electricity, to secure the co-ordination and efficient interconnection of electrical undertakings, to ensure the orderly control of extensions and additions to existing undertakings, and to scrutinize expenditure and ensure the economic working of all electricity undertakings throughout the State."

To accelerate the provision of electricity supplies from end to end of this sparsely populated State, whose prosperity is dependent on the efficiency and well-being of its farms, the Commission created Regional Electricity Boards to control and speed the development of electricity in the country districts. The Cairns, Townsville, Capricornia and Wide Bay-Burnett Regional Boards have adopted extensive programmes of electrical development including the erection of new generating stations and power transmission lines. These developments were hampered by the shortage of labour and basic materials which followed the war and almost brought the programme to a standstill.

To expedite the work, the State Electricity Commission, acting on behalf of the Regional Electricity Boards in early 1951, called for tenders for the erection of power lines to serve the rural areas. Rapid progress is being made on these lines, the first to be erected by overseas contractors in the State of Queensland. Details are given below.

Cairns R.E.B.			
Mareeba-Mount Molloy	66 kV	26 miles	Complete
Mount Molloy-Mossman	22 kV	18 miles	Complete
Silkwood-South Johnstone	22 kV	17 miles	70 per cent complete
Capricornia R.E.B.			
Gladstone-Bajool	66/22 kV	48 miles	Complete
Beecher-Monto	66/11 kV	81 miles	70 per cent complete
Wowan-Baralaba	22 kV	38 miles	Not yet commenced
Monto-Selene	11 kV	14 miles	Complete
Yeppoon-Emu Park	11 kV	9 miles	Complete
Monto-Thangool	66 kV	48 miles	Not yet commenced

Much of the country to be traversed by the new lines is heavily wooded and the first essential, after the route has been agreed, is to clear all trees on each side of the centre of the route to provide a fairway for the line. The clearances to be maintained along these fairways are 132 kV lines, 50ft; 66/33 kV lines, 30ft; 11/6·6 kV lines, 20ft; l.v. lines, 10ft.

A 10ft wide track, to form an access path for line erection and for future line patrols, runs along the centre of the route and is cleared to ground level, except that trees of above

* British Insulated Callender's Construction Co., Ltd.

The title picture gives an indication of the terrain across which the Beecher–Monto 66/11 kV line passes. Below: The Mareeba–Mount Molloy 66 kV line; flood waters covering the Mareeba–Mount Molloy main road

6in diameter may be felled stump high. Felling in this way can lead to trouble when augering holes for pole footings, since the roots remaining foul the auger. In general it is preferred that the clearing be done by bulldozer or tractor and cable so that the stumps are pulled out of the ground, leaving the access track free from obstruction.

Pick and shovel excavation of pole footing holes is rarely used except where access precludes the use of mechanical truck-mounted earth augers. When drilling stay holes, where the auger must be sent down three times, shutter boards are used to prevent the excavated soil from falling back into the adjacent hole as the spoil is ejected by the spinning auger.

Before setting, all poles receive two coats of creosote and when dried a further thick hot coat of creosote and tar. This extends over the length of pole to be buried in the ground plus an additional 2ft. All cutting and notching for cross-arms receives similar treatment.

Mount Molloy–Mossman 22 kV line. Earth borer drilling a pole hole. On this section the timber has been cut stump high and trouble has been experienced

Care is taken when backfilling footing holes to ensure that the return earth is well rammed to about 18in below ground level. At this point a metal sleeve is placed round the pole and the 2in spacing between the pole and the sleeve is back-filled with sifted soil well mixed with creosote; this filling and the free backfill beyond the sleeve are added concurrently, the sleeve being gradually raised as the level of the soil rises. The soil and creosote filling is carried up an inch or so above the level of the surrounding soil and sloped off to provide drainage.

Truck-mounted derrick legs are used for erecting the line poles. Some of the 55ft poles of ironbark try the derrick to its limit. Ironbark, which is in the highest class of durable timber, weighs 80 lb/cu ft first cut and averages 65 lb/cu ft as used against the normal dry weight of about 30 lb/cu ft for red fir.

Vibration Sagging

Conductor running follows normal practice and the sighting board method of sagging is in general use. On occasions, however, the vibration method of sagging has been used on long spans down steep ravines and when conductors have to be sagged at night. The vibration method of sagging, which is often used in Australia, is not in frequent use in Great Britain. Using this method the line is pulled down with a rope or hooked stick and suddenly released. This creates a travelling wave which travels to the point of support and is there reflected. The time taken by the wave to travel from one support to the other and back is measured with a stop-watch.

The sag in feet is $1{\cdot}006\ T^2$, where T is the time in seconds for the wave to travel the length of the span and back to the starting point. In practice a stop-watch is started at the first return of the wave and stopped at the sixth jerk which follows. A simple graph is available showing the time in seconds for the sixth jerk plotted against the sag in feet.

The conductor in general use is 0·058 sq in (7/·104in) hard drawn copper. It is used on all 66 kV, 22 kV and 11 kV lines and on many of the l.v. lines. For l.v. distribution work 0·053 sq in (7/·08in) hard drawn copper is occasionally used. The average span for 66 kV lines is 650 ft with a still-air maximum temperature sag of 12ft 6in. Joint-use lines, 66/11 kV and 66/22 kV, have average spans of 450ft and maximum temperature still-air sags of 6ft 3in. Many of the joint-use 22 kV/l.v. and 11 kV/l.v. lines also have an average span of 450ft with a sag of 6ft 3in. In other cases, a slacker line-stringing basis is adopted for joint-use 11 kV/l.v. distribution lines when an average span of 250ft is employed with a still-air summer sag of 5ft.

The lines are designed to comply with a standard specification, the salient points of which are: still air ground clearance at 120 deg F for 11 kV, 22 kV, and 66 kV lines, 20ft; temperature range, 100 deg F; snow or ice loading, nil; wind pressure on circular surfaces, i.e., conductors at 20 deg F, 10 lb/sq ft, conductors at 60 deg F, 15 lb/sq ft.

Ironbark timber has an ultimate extreme fibre stress of 14,500 lb/sq in but, to allow for varying qualities of timber, and the fact that green timber poles are used, a design figure of 12,000 lb/sq in has been adopted. The factors of safety based on ultimate strength are wood poles 4, wooden crossarms 4, galvanized steel stay wires 3, and hard drawn copper conductors 2.

Arduous Conditions

Some of the line erection work has been carried out under very arduous conditions, as may be seen from the accompanying photographs. Among the difficulties experienced are flooding during the wet season, from January to March, when many of the roads become impassable. The floods in the valley of the Fitzroy River, which has a catchment area of 55,000 sq miles, last February reached levels almost as high as ever attained in the valley, and the flooding in Rockhampton, the headquarters of this work, was particularly serious.

In the scrub country going is particularly heavy and difficult in places and severe side slopes have meant that lorries or tractors could not be used and poles have had to be hauled into position by teams of horses. In the dry season bush fires have created problems and at times materials have had to be withdrawn from the track of the fires raging towards the line clearings. On the Yeppoon–Emu Park line salt pans which are tidal had to be negotiated and there are only a few weeks in the year when transport can cross these pans. The staff engaged on the work are housed in caravans which move forward as the work proceeds.

In Queensland considerable use is made of single-phase supplies in rural areas. Besides reducing costs the use of single-phase supplies in the absence of large motor loads has enabled more consumers to be supplied from the limited amount of materials which are available. A recent development of interest is the use of the single-phase single-wire earth-return system of building rural lines. Two lines of this type have been built in the area of the Cairns Regional Electricity Board. One feeds 20 maize-growing farms in the Upperton area and the other, in the Melindy area, supplies 13 dairy farms. First reports show that these lines are functioning satisfactorily and the Post and Telegraph engineers report that there has not been any undue interference noticeable on the telephone circuits. This earth-return system is widely used in New Zealand, where it was sponsored by Mr. Lloyd Mandeno, consulting engineer to the Bay of Plenty Power Board, in whose area some 250 miles of single-wire earth-return lines have been in service for many years.

A measure of the growth in the use of electricity in the farming districts of Queensland can be gained from the accompanying tables, which have been extracted from the annual reports of the Electricity Commission.

Total Number of Consumers

Regional Electricity Boards	1947	1948	1949	1950	1951	1952
Cairns	10,705	11,193	11,904	12,704	13,631	14,654
Capricornia	11,517	13,127	13,736	14,484	15,175	15,777
Townsville	12,657	13,715	13,986	15,303	16,050	16,475
Wide Bay	9,844	11,015	12,119	13,133	13,959	18,687
South Burnett... ...	—	2,520	2,646	2,746	2,892	

Total Sales in Million kWh

Regional Electricity Boards	1947	1948	1949	1950	1951	1952
Cairns	20·9	24·6	27·4	32·7	39·5	46·0
Capricornia	18·3	20·6	24·0	25·7	29·6	34·1
Townsville	22·8	28·9	31·9	35·4	42·8	50·3
Wide Bay	10·5	12·3	15·2	17·3	18·9	25·8
South Burnett... ...	—	2·2	2·9	3·0	3·2	

Average Consumption (kWh) per Consumer

Regional Electricity Boards	1947	1948	1949	1950	1951	1952
Cairns	1,957	2,192	2,303	2,571	2,899	3,138
Capricornia	1,585	1,571	1,745	1,776	1,952	2,160
Townsville	1,800	2,110	2,280	2,315	2,664	3,053
Wide Bay	1,067	1,115	1,254	1,316	1,354	1,381
South Burnett... ...	—	1,172	1,103	1,108	1,115	

Average Consumption (kWh) per Consumer (excluding Consumers and Consumption in Respect of Street Lighting, Water Supply Pumping and Bulk Supply at Special Rates)

Regional Electricity Boards	1947	1948	1949	1950	1951	1952
Cairns...	1,906	2,135	2,249	2,511	2,843	3,081
Capricornia	1,552	1,538	1,712	1,743	1,921	2,130
Townsville	1,613	1,942	2,246	2,280	2,628	3,016
Wide Bay	1,031	1,075	1,215	1,272	1,311	1,348
South Burnett... ...	—	1,116	1,062	1,067	1,079	

Average Revenue per Consumer (excluding Revenue received in respect of Street Lighting, Water Supply Pumping and Bulk Supply at Special Rates)

Regional Electricity Boards	1947	1948	1949	1950	1951	1952
Cairns	£ s d 15 0 1	£ s d 16 10 6	£ s d 19 11 7	£ s d 20 17 8	£ s d 22 7 2	£ s d 27 1 2
Capricornia	13 7 5	12 14 9	15 15 3	15 17 5	19 2 4	23 15 2
Townsville	13 15 10	15 18 10	20 9 8	19 17 7	24 16 8	36 19 3
Wide Bay	10 5 0	10 11 7	12 17 6	13 8 1	19 3 1	21 4 3
South Burnett... ...	—	17 3 9	16 18 9	18 1 3	21 9 7	
Basic Wage (Male) (at end of Year) ...	5 5 0	5 15 0	6 13 0	8 6 0	10 7 0	10 18 0

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" Developments in Extra-High-Tension Electrical Transmission in New Zealand," by B. L. Montgomery.

" Experimental Installation of Single-Wire Earth-Return Transmission," by A. D. Dowsett, *Electrical Engineer and Merchandiser*, 15th December, 1953.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Social Service

MAY I say I support " Reflector " in his remarks on this subject. " Social service " as he and I and most other people understand it means " service to society." The two words require qualifying before we can read into them such things as who pays for it. For instance, we have the voluntary social services, examples of which are such well-known organizations as Old Peoples' Welfare Committees, Citizens' Advice Bureaux, etc. The implication here is that the labour for carrying out such service is usually provided free of cost. On the other side we have the Government provided social services, the best known example being the health service. In addition, there are many sections of industry which provide a service (albeit paid for) to society and I can see no reason why a proper supply of electricity should not be considered one of these.

In conclusion—and I trust I am not wrong—may I point out that Alderman Bennett's Consultative Council, in acting as a link between consumer and producer, is performing a useful social service.

Broxbourne, Herts. T. L. FRANKLIN.

Electric Floor Heating

REFERRING to the article on " Electric Floor Heating " in your issue of 23rd July, may I bring to your notice an early example of this method of heating buildings which was developed by the late Mr. E. Fawssett, M.I.E.E., F.C.G.I., test engineer of the old North Eastern Electric Supply Co., in conjunction with the writer.

In 1935 a reconstructed floor was laid with continuous ducts and a 2in screed overall. Scrap condenser tubes were laid in the ducts and loaded up to 14 watts/sq ft of floor at low voltage.

In the second installation, which was a new building in 1938, soil heating cables were laid on the rough cast concrete floors with a 2in screed overall. This was loaded at 12·5 watts/sq ft of floor at mains voltage.

Both installations, operating at off-peak periods and with controlled output, continue to give an ideal, economic and satisfactory service.

Gosforth, Newcastle-on-Tyne. S. NEVENS.

Financial Section

STOCKS and SHARES

A LULL of investment activity in August can generally be relied upon to provide the opportunity for taking stock of the market situation before the resumption of more general business in the autumn. On this occasion, however, business continues to run at a level far above the normal for the holiday season, and the extent to which prices have moved over the first three parts of the year is, also, very much out of the common. For the substantial, and often spectacular, improvements shown in the following tables of electrical ordinary shares, a good deal of the credit goes to the robust strength shown by the gilt-edged market.

British Electricity Issue

The long-expected issue of British Electricity stock has at last made its appearance; an extra £100 million of 3½ per cent stock is added to the existing 1976–79 issue the price of which stands at 101½. The new stock is offered at 100½, but the older issue includes about 18s per cent interest in its current quotation, so that the price of the new stock is adjusted in order to rank almost precisely with that of the former stock. All four Electricity stocks went slightly easier as a result of the newcomer's advent; other gilt-edged prices were, to some extent, affected. On the whole, however, quotations are well maintained, and there seems to be little doubt in the market as to the success of the new British Electricity 3½ per cents, in spite of the large amount offered.

East African Power

The lists were closed yesterday, Thursday, for £3½ million 5 per cent convertible debenture stock, 1966–1969, issued at 100½ by the East African Power & Lighting Company. Various conversion rights are attached to the stock, and give it an attractive appearance as an investment security. In the Stock Exchange market, it is thought that there may be a modest premium when dealings start in the stock.

Insatiable Investment

With Stock Exchange prices at their present levels, it is safe to say that thousands of investors can see handsome profits on the prices which they originally paid for their securities. On the other hand, it is true that in the gilt-edged boom of a few years ago, prices were standing higher than they are to-day though there has recently been a substantial improvement even in this department; still more, of course, in the industrial and commercial sections round the Stock Exchange. In spite of to-day's high prices, the employment of money by institutions—insurance companies, banks, pension funds and similar channels of investment—continues to absorb blocks of stock and shares when these come to market, with the result that each successive wave of demand finds a diminishing amount of

The Week's Price Changes

Company or Board	Nom. Value	Middle price 16th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	96½		3	3	3 2 3	97	88⅝
Brit. Elec. 1974/77	100	95xd		3	3	3 3 2	96½	87½
Brit. Elec. 1976/79	100	101½		3½	3½	3 9 0	101½	93 8/16
Brit. Elec. 1974/79	100	111½		4¼	4¼	3 16 3	111½	103 3/16
Overseas Electric Supply								
Calcutta Elec.	£1	21/6	+3d	6†	6†	5 10 4	21/9	18/7
East African Power	£1	22/-		7	7	6 7 3	23/4	19/6
Nigerian Elec.	£1	24/-		10	10	8 6 8	25/-	23/6
Palestine Elec. "A"	£1	20/6		Nil	Nil	Nil	20/6	16/-
Perak Hydro-Elec.	£1	15/9	+9d	Nil	6	7 12 4	16/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	11/6	−6d	25	12½*	5 8 8	12/-	8/1
Aerialite	1/-	12/6		88⅛	88⅛	7 1 6	12/6	10/9
Allen, W. H.	£1	74/6		15	20	5 7 6	74/6	50/-
Aron Elec. Ord.	£1	45/-		20	15	6 13 4	50/-	43/-
Assoc. Elec. Ord.	£1	60/-		20	11¼*	3 15 0	60/-	41/6
Automatic Tel. & El.	£1	72/6	+3/9	15	15	—	73/-	57/3
Babcock & Wilcox	£1	62/3		18	12*	3 17 2	62/3	47/3
Baldwin, H. J.	2/-	4/6		20	20	8 18 0	5/6	3/9
Bakelite	10/-	26/3		12½	12½	4 15 3	27/6	23/6
British Aluminium	£1	36/3	+6d	12	10	5 10 4	40/-	34/6
B.I. Callender's	£1	46/6	+3d	10	10	4 6 0	46/6	37/9
B.I. Callender's 6% Pref.	£1	26/-		6	6	4 12 3	26/-	24/3
British Thermostat	5/-	23/9		35	27½*	—	23/9	12/-
British Vac. Cleaner	5/-	14/6		25	25	8 12 6	14/6	11/6
Brook Motors	10/-	42/6		20	20*	4 14 3	42/6	33/3
Brush Ord.	5/-	7/-		4	6	4 5 9	7/-	3/6
Bulgin, A. F.	1/-	3/6	+3d	30	30	8 11 6	3/7	3/2
Burco	5/-	17/-	+6d	35	35	5 3 0*	17/-	12/1
Chloride El. Storage	£1	67/6		20	12½*	3 14 0	68/-	46/6
Clarke Chapman	£1	67/6		17½	20	—	67/6	47/6
Cole, E. K.	5/-	33/9		25	27½	—	38/9	22/6
Cossor, A. C.	5/-	10/6	+3d	10	10	4 15 3	10/6	7/-
Crabtree	10/-	28/9		17½	17½	6 1 9	29/6	23/9
Crompton Parkinson Ord.	5/-	18/3		11¼	20	5 9 7	18/3	14/-
De La Rue	5/-	20/-	+1/6	Nil	20	5 0 0	21/-	12/3
Decca	4/-	43/-		150	35*	—	43/-	32/-
Desoutter	5/-	19/3		18	20	5 4 0	19/3	16/1
Dewhurst	2/-	6/-		19	19	6 6 9	6/3	5/1
Dictograph Tel.	2/-	6/6		20	20*	6 3 0	6/6	5/2
Dubilier Condenser	1/-	5/6		25	25	4 11 0	6/-	4/1
E.M.I.	10/-	19/-		12	8	4 4 3	19/-	11/3
Electrical Components	5/-	13/9	+6d	20	20	7 5 6	13/9	10/9
Elec. Construction	£1	61/3	+6d	15	15	4 17 0	61/3	53/-
Enfield Cable Ord.	£1	22/6	+1/3	5	Nil	Nil	25/-	16/6
English Electric	£1	55/-	+3/-	15	10*	3 12 9	55/-	38/-
English Electric 3½% Pref.	£1	16/6		3½	3½	4 11 0	16/6	15/3
Ericsson Tel.	5/-	26/6	+3d	22†	25†	2 7 2*†	26/6	22/9
Ever Ready	5/-	25/6		35	40	—	25/6	17/9
Falk Stadelmann	£1	38/6xd		15	15	7 15 10	41/-	36/6
G.E.C. Ord.	£1	52/6	+2/6	11½	12½	4 15 3	52/6	37/6
G.E.C. 6½% Pref.	£1	27/-		6½	6½	4 16 3	27/3	26/6
General Cables	5/-	17/-	+3d	30	30	8 16 6	17/-	16/3
Greenwood & Batley	£1	50/-		17½	17½	7 0 0	50/-	40/3
Hackbridge Cable	5/-	15/9	+9d	20	20	6 7 0	15/9	11/3
Hackbridge & Hewittic	5/-	22/6		20	25	5 11 0	23/3	16/10
Hall Tel. Acc.	10/-	12/-	+6d	10	10	8 6 8	13/-	10/6
Heatrae	2/-	5/-		12½	12½	5 0 0	5/-	4/-
Henley's	10/-	19/-	−6d	10½	10½	5 10 6	19/6	15/6
Holophane	5/-	15/3		20	20	6 11 2	15/3	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

supply available, with the inevitable consequence of prices going higher.

With the aid of this year's second reduction in Bank Rate, and of a greater sense of security regarding the state of the nation's finances as a whole, the rises in British Government stocks have given strong support to the vigorous advance of the industrial market. Of the former, the British Electricity stocks are about 7 to 8 points to the good since the beginning of this year. In the industrial sections, quotations display the beneficial influence of improved company earnings and of less austerity in dividend decisions; also of a number of capitalization issues and of general confidence in the further trading outlook. As measured by the popular indices, the rise in the value of leading industrial shares since January is of the order of 25 per cent. The following tables set out some of the changes that have taken place.

in Electrical Investments

Company or Board	Nom. Value	Middle price 16th Aug.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	43/-	+2/3	25	45	5 4 8	43/6	26/3
I.C.I.	£1	37/9	+1/-	13	15	3 19 6	39/-	26/6
Intl. Combustion	5/-	24/-		15	20	4 3 4	24/-	14/6
Johnson & Phillips	£1	52/6	+3/3	15	15	5 14 3	52/6	47/6
Lancashire Dynamo	£1	59/-	+1/6	12½	14	4 15 0	59/6	43/-
Laurence, Scott	5/-	23/9	−1/3	15	20	4 4 3	25/-	14/-
Lister, R. A.	£1	43/-		9	12	5 11 7	43/6	31/9
London Elec. Wire	£1	46/3		15	10*	4 6 7	47/3	38/-
Lucas, J.	£1	37/6	+1/3	9⅛	10⅓	—	37/6	25/3
Marryat & Scott	2/-	7/-		22½	25	7 2 9	7/-	5/11
Mather & Platt	£1	46/6	+1/-	12½	15	—	47/-	32/-
Metal Industries	£1	35/6	+1/6	12	9	5 1 0	42/3	29/6
Midland Elec. Mfg.	£1	67/6		15	15	4 9 0	67/6	63/-
Morphy-Richards	4/-	20/-		40	40	—	20/-	11/4
Murex	£1	52/6	+1/6	15	15	5 14 3	57/-	50/-
Newman Ind.	2/-	2/4½		10	10	8 8 5	2/6	2/-
Oldham & Son	1/-	3/-		17½	17½	5 16 8	3/4	2/5
Parnall (Yate)	5/-	8/10½	+10½d	6	8	4 10 2	9/-	4/3
Parsons, C. A.	£1	58/9	+2/6	12½*	7½*	2 11 2	59/-	38/1
Plessey	10/-	57/6		25	30	—	57/6	37/10
Pye Deferred	5/-	29/6	+2/-	20	20*	3 7 9	29/6	15/7
Revo	10/-	14/-		27½	9*	6 8 6	20/3	14/-
Reyrolle	£1	90/-	+1/3	12½	13¾	3 1 0	90/-	66/-
Rheostatic	4/-	15/-	+9d	19	20	5 6 8	15/-	11/-
Richardsons Westgarth	5/-	12/3		15	15*	6 2 6	12/3	6/6
Scottish Cables	4/-	21/-	+1/3	20	27½	5 4 8	21/-	12/11
Siemens Ord.	£1	39/6		10	10	5 1 3	43/9	33/9
Smith (England), S.	4/-	13/-	+6d	12½	15	—	13/-	7/8
Southern Areas	£1	27/6	+6d	6	7½	5 9 1	27/6	17/6
Strand Elec.	5/-	8/9		17½	17½	10 0 0	9/3	8/3
Sturtevant	5/-	40/9		18·1†	18·9*†	2 5 6†	40/9	29/-
Sun Elec.	£1	32/6		15	15	9 4 8	32/6	27/6
Switchgear & Cowans	5/-	12/9		22½	10	3 18 6	13/7	9/9
Taylor Tunnicliff	5/-	11/-		25	12½*	5 13 9	12/4	10/7
T.C.C.	10/-	33/9		20	30*	—	33/9	21/3
T.C. & M.	£1	33/9		10	8½*	5 0 9	34/6	30/3
Telephone Mfg.	5/-	9/-		10	10	5 14 3	9/-	7/6
Thorn Elec.	5/-	22/9		12½	20	4 8 0	22/9	13/3
Thornycroft	£1	43/-	−1/6	15	15	6 19 6	47/6	33/4
Tube Investments	£1	68/9		15*	15	4 7 3	68/9	60/3
Vactric	5/-	17/-	+3d	Nil	10	2 18 9	17/6	7/6
Veritys	5/-	6/9		10	12½	9 5 3	8/3	5/-
Walsall Conduits	4/-	51/3		70	70	5 9 4	52/6	44/-
Ward & Goldstone	5/-	38/9xc		45	50	—	64/6	38/9
Watford	2/-	6/9		25	22½*	—	6/9	4/7
Westinghouse Brake	£1	72/6	+1/3	14	15	4 2 9	72/6	60/9
West, Allen	5/-	16/3	+6d	15	17½	5 7 8	16/3	12/7
Wolf Electric	5/-	14/9		15	17½	5 18 9	14/9	11/-
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A Ord.	100	83½		—	6	7 3 9	89½	80
Ord.	100	52½		—	3¾	7 2 10	55½	52
Anglo-Portuguese	£1	24/-		8	8	6 13 4	24/-	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	61/-	+1/6	35	50	4 2 0	61/3	39/1
Cable & Wireless:								
Ord.	£1	39/6	+1/-	8	9	4 11 2	40/6	26/2
4% Loan	100	98½		4	4½	4 1 3	98½	95½
Calcutta Trams	£1	21/6	+6d	6†	2½†	—	21/6	17/1
Cape Elec. Trams	£1	17/6	+2/6	5½	7½	8 11 6	17/6	12/4
Marconi Marine	£1	33/9		10	10	5 18 6	33/9	27/6
Oriental Tel. Ord.	£1	95/-	+3/-	16	16	—	95/-	82/6
Telephone Props.	£1	5½		8	8	—	5½	4¾
Telephone Rentals	5/-	10/6		10	10*	—	10/6	9/-

Electrical Equipment Shares

The shares of most of the large electrical equipment and engineering groups have been well to the fore of the advance in the industrial market. Here are representative examples:

Ordinary Share	Price 4th Jan.	Price Now	Rise
A.E.I.	42/6	60/-	17/6
Crabtree	23/9	28/9	5/-
Crompton Parkinson	14/3	18/3	4/-
Elec. Construction	53/9	61/3	7/6
English Electric	39/9	55/-	15/3
G.E.C.	38/9	52/6	13/9
Lancs. Dynamo	43/9	59/-	15/3
C. A. Parsons	38/3	58/9	20/6
A. Reyrolle	66/3	90/-	23/9
Westinghouse	61/9	72/6	10/9

In this, and in the tables following, the year's opening prices have been adjusted for subsequent capitalization issues, but not for offers of new shares for cash.

Cables and Telephones

A certain amount of irregularity in the annual results of the cable manufacturers is reflected in the course of share prices, but some notably good features are to be recorded in this, as well as in the telephone group:—

Ordinary Share	Price 4th Jan.	Price Now	Rise
Auto. Tel.	58/-	72/6	14/6
B.I.C.C.	38/3	46/6	8/3
Dictograph	5/3	6/6	1/3
Enfield	17/6	22/6	5/-
Ericssons	24/6	26/6	2/-
Henleys	16/-	19/-	3/-
Johnson & Phillips	50/-	52/6	2/6
Lon. Elec. Wire	38/6	46/3	7/9
Siemens	35/-	39/6	4/6
T.C. & M.	31/6	33/9	2/3
Telephone Manufg.	7/6	9/-	1/6

Miscellaneous Changes

Many improvements of a spectacular order figure in the following group of shares in companies concerned with radio and electronics, batteries, boilers, motor components and other branches of the electrical manufacturing industries:—

Ordinary Share	Price 4th Jan.	Price Now	Rise
Babcock & Wilcox	48/3	62/3	14/-
B.E.T.	39/6	61/-	21/6
British Thermostat	12/6	23/9	11/3
Brush	4/-	7/-	3/-
Cable & Wireless	26/9	39/6	12/9
Chloride Electric	48/9	67/6	18/9
Cole, E. K.	23/9	33/9	10/-
Cossor, A. C.	7/3	10/6	3/3
De La Rue	13/-	20/-	7/-
E.M.I.	11/6	19/-	7/6
Ever Ready	18/3	25/6	7/3
Hoover	27/-	43/-	16/-
I.C.I.	27/-	37/9	10/9
Lucas	25/9	37/6	11/9
Plessey	39/-	57/6	18/6
Pye	16/-	29/6	13/6
S. Smith	8/-	13/-	5/-
Tube Investments	62/6	68/9	6/3

REPORTS and DIVIDENDS

John Thompson, Ltd.—In a statement circulated with the report and accounts for the year ended 31st December, Mr. E. W. Thompson, chairman and managing director, stated that the name of the recently purchased B.V.C. Industrial Constructions, Ltd., would shortly be changed to John Thompson Industrial Constructions, Ltd., which would operate as a separate subsidiary company of John Thompson, Ltd. The acquisition of this company would extend their scope in the power station field and enable them to offer their boiler customers a greater choice of pneumatic and hydraulic ash and dust disposal plant. Existing contracts taken over totalled over £1,650,000 and further orders obtained since taking over on 1st February amounted to £250,000. The company had also bought a controlling interest in E. Leonard & Sons, Ltd., the oldest firm of boiler makers in Canada. A new research and development building would be completed in six to nine months.

Electrical Components, Ltd.—In their report for the year ended 31st March the directors state that the improvement on the electrical side of the business continued throughout the year. There was also a substantial volume of television and radio business during the earlier part of the year, which coincided with the Coronation and the enlargement of the area of television reception. On the other hand costs of distribution have continued to rise and the market has become more competitive. The consolidated trading profit was, however, £138,907, as compared with £110,008 in 1952–53. Exceptional or non-recurring credits brought the total to £140,980 (£114,480), from which had to be deducted taxation amounting to £80,309 (£65,305). The general reserve fund again receives £10,000 and the contingencies and bad debt reserve £5,000 (same). After paying a final dividend of 12½ per cent, making 20 per cent for the year (same), £103,416 (£79,163) is carried forward.

Cable & Wireless, Ltd.—For the year ended 31st March the profit before tax amounted to £2,064,438, which is £286,632 more than for the previous year. Taxes take £966,729 (£1,210,771), equalization of U.K. tax £265,404 (£25,000), staff pensions £100,000 (nil), British Government and other securities written down £447,551 (nil) and capital reserve £300,000 (nil). It is proposed to increase the dividend from 3 to 4 per cent, the carry-forward being reduced from £1,020 308 to £708,762.

The East African Power & Lighting Co., Ltd., reports that the group operating surplus and sundry receipts for the year ended 31st December amounted to £945,223 (£681,981). There was a continued increase in the company's business and in that of the Kenya and Tanganyika subsidiaries, sales of electricity being approximately 17 per cent above those for the previous year. Considerable progress was made on the company's programme for the development for East Africa, a sum of £2,224,339 being spent during the year in Kenya and Tanganyika. Underwriting of an issue of £3½ million 5 per cent convertible debenture stock was completed by the Power Securities Corporation last week.

Yesterday (Thursday) subscription lists were to open and close for the issue of £3,500,000 5 per cent convertible debenture stock, 1960–69, at £100½ per cent, preferential consideration being given to applications from holders of the £300,000 of 7 per cent cumulative preference stock and £4,851,110 ordinary stock of the company and from the staff and consumers in Kenya and Tanganyika. Proceeds of the issue are required for the repayment of temporary borrowings of £3 million and for financing further plant extensions.

British Electricity Authority.—Applications were invited this week (the list opening and closing on Wednesday) for £100 million 3½ per cent guaranteed stock, 1976–79, at an issue price of £100 10s per cent. The proceeds of the issue are to be used to reduce the amount temporarily borrowed by the Authority and for other authorized purposes. At 31st July temporary borrowings amounted to £104,645,000. Until 11th October the new stock will be known as British Electricity 3½ per cent guaranteed stock, 1976–79, "A." After that date it will be amalgamated with the existing 3½ per cent stock issued in May, 1950.

Newman & Watson, Ltd.—In a circulated address presented at the annual general meeting last week Mr. B. W. Mason, chairman, said that the company had again had a successful year's trading, the combined net profit of the group being £89,723, as compared with £71,667 last year. Taxation absorbed £48,305. It was proposed to increase revenue reserves by £12,096 and to pay an ordinary dividend of 20 per cent (15 per cent), plus a capital distribution of 2½ per cent (same).

Hoover, Ltd.—In view of persistent reports that a scheme of re-organization of the share capital is under consideration on terms which would give each "A" share rights in excess of those attaching to each unit of ordinary stock, the directors state that there has been under review a scheme of re-organization of the equity share capital for submission to both ordinary and "A" ordinary shareholders. There is no foundation whatsoever in the terms suggested in these current reports and should any proposals be put forward they would not result in the "A" shares acquiring rights more favourable than those attaching to the ordinary shares.

Telephone Properties, Ltd.—Proposals are to be submitted to ordinary stockholders either to exchange 75 per cent of their stock for shares in a new realization company or retain the whole of their stock in Telephone Properties.

The London Electrical & General Trust, Ltd., is increasing its final dividend from 9½ to 11 per cent, making 15 per cent (12½ per cent). The preliminary results show that the gross revenue for the year ended 30th June amounted to £106,240, as compared with £95,309 in the previous year.

James Howden & Co., Ltd.—At an extraordinary meeting sanction was given to a scrip issue of one 10s ordinary share for every two 5s units held on the 2nd August.

Metal Industries, Ltd.—Group profits declined by £448,697 to £1,327,584 for the year ended 31st March, the trading profits of the subsidiaries being £1,100,923 (£1,540,567). After providing for taxation of £421,096 (£858,971), etc., the group net profit attributable to M.I. is £343,140 (£612,070). The dividend is reduced from 12 to 9 per cent.

The Telegraph Construction & Maintenance Co., Ltd., is maintaining its interim ordinary dividend at 3¾ per cent.

Liquidations

Smith & Forshaw, Ltd., electrical contractors, 5, Blayd's Yard, Lower Briggate, Leeds, 1.—Liquidator, Mr. J. G. Beaumont, 32–33, Commercial Street, Leeds, 1, appointed on 30th July by the creditors.

County Electronics, Ltd.—Meetings of members and creditors on 27th August at the offices of Harry L. Price & Co., 47, Mosley Street, Manchester, 2.

S.R.M. Television, Ltd., manufacturers, service engineers and dealers in radio, television, electrical appliances, etc., Sylvan Avenue, Leicester.—First meetings 26th August at the Official Receiver's office, 27, Regent Street, Park Row, Nottingham.

Wm. Hodgkins & Co., Ltd., wholesale electrical suppliers, 19, St. George Street, Leicester.—Liquidators, Mr. E. E. V. Rowley, 20, Friar Lane, and Mr. R. A. Haigh, Court Chambers, Friar Lane, both Leicester, appointed by the creditors on 30th July. Claims by 22nd September.

Brocks Refrigeration, Ltd., refrigeration and electrical engineers, 17, Eldon Square, Newcastle-upon-Tyne. — First meetings held 18th August at the Official Receiver's office, Clarendon House, Clayton Street West, Newcastle.

Hattons (Billingham), Ltd., electrical and plumbing engineers, 43, The Green, Billingham, Co. Durham.—First meetings to-day (Friday), at the Official Receiver's office, 4, Bridge Road, Stockton-on-Tees.

Edolite Lamps, Ltd., manufacturers and merchants of electric lamps, 8, Heaton Street, Blackburn.—Liquidator, Mr. A. T. Eaves, 47, Mosley Street, Manchester, appointed 29th June, with a committee of inspection.

Articair Refrigerators, Ltd., refrigerator manufacturers, 16, Manchester Square, London, W.1.—First meetings 25th August at Room 401, Inveresk House, 346, Strand, London, W.C.2.

Bankruptcies

F. Monk, electrical and radio engineer, Ashby Road, Stapleton, Leicester. — Receiving order made 6th August on a creditor's petition.

B. T. Smith, electrical engineer and contractor, carrying on business at The Studio, Ramsgate, Louth.—Proofs for dividend by 31st August to the trustee, Mr. L. F. McCulloch, 26, South St. Mary's Gate, Grimsby.

F. B. E. Hobson, electrical and mechanical engineer, carrying on business at 6, Church Road, Leighton Buzzard, as "Hobson & Partners," and at Wells Yard, Upton Road, Watford, as "Wilson Electrical."—Receiving order made 4th August on debtor's own petition.

R. J. Camden, electrical engineer, 32, New Bridge Street, Exeter.—Proofs for dividend by 28th August to the trustee, Mr. G. C. Ehlers, 28, Baldwin Street, Bristol, 1.

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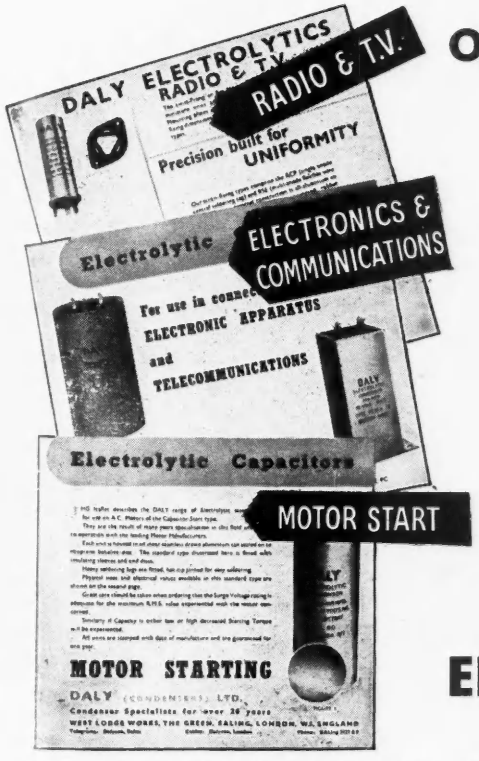

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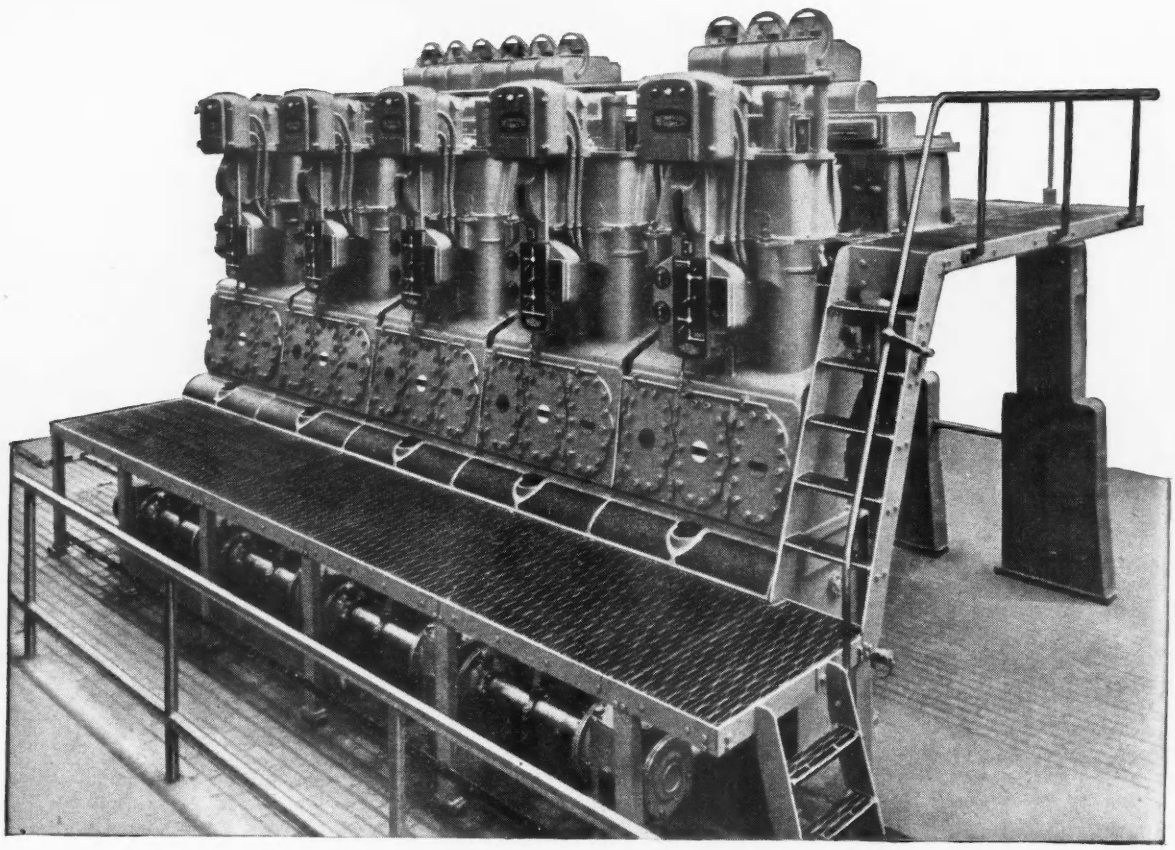

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WESTERN GERMANY'S ELECTRICAL EXPORTS

Strong Recovery in 1953

FULL details of Western Germany's electrical export trade in 1953 have now been issued. They confirm the frequent statements that have been current regarding her successful resumption of competition in almost every market. She is reckoned by the British Board of Trade to have enlarged her share of world trade in electrical apparatus from 8 per cent in 1950 to 17 per cent in 1953. Then the total value of exports of electrotechnical products, including machinery, was DM.1,243 million, an increase of DM.183 million on 1952. The advance spread throughout nearly every group and was marked in radio apparatus and power plant over 1,000 kW. In generators and motors up to 1,000 kW there was a decrease.

Of the total value nearly one-twelfth went to the Netherlands which thus displaced Sweden (chief customer in 1952). Sweden and Italy stood out next with Belgo-Luxemburg not far behind. Then came Switzerland, Norway and Brazil, followed by Turkey and many European countries. Germany also did a large business in Argentina, Egypt, India, Indonesia and Venezuela. (£1 = DM.11·76.)

Class of Goods	1953 DM(000)	Inc.or dec. on 1952 DM (000)
Generators and motors up to 10 kW	30,283	− 2,880
To Belgium	2,260	− 468
,, Netherlands	4,547	+ 2,005
,, Norway	2,171	− 331
,, Sweden	4,630	− 863
,, Switzerland	2,265	+ 871
,, Turkey	676	− 1,278
,, Brazil	395	− 2,109
,, France	1,612	+ 1,011
,, Italy	952	+ 11
,, Yugoslavia	814	+ 373
Ditto, 10 to 1,000 kW	47,450	− 10,623
To Yugoslavia	1,725	− 82
,, Netherlands	3,518	− 1,801
,, Norway	2,952	− 1,254
,, Sweden	4,526	− 5,611
,, Turkey	1,885	− 640
,, Pakistan	2,241	+ 1,814
,, Brazil	3,646	− 1,957
Ditto, over 1,000 kW	29,250	+ 16,602
To Norway	6,853	+ 5,258
,, Turkey	5,340	+ 4,787
,, Mexico	2,564	+ 2,500
,, Spain	900	− 1,196
Generator sets	115,816	+ 3,470
To Italy	14,855	+ 9,416
,, Argentina	10,865	− 4,636
,, Indonesia	5,859	+ 213
,, Brazil	28,655	+ 13,301
Transformers and chokes	47,683	+ 4,366
To Finland	4,739	+ 1,440
,, Greece	1,798	+ 485
,, Sweden	7,047	− 1,139
,, Irish Republic	2,054	+ 839
,, Turkey	3,535	+ 1,729
,, India	2,940	+ 2,317
Current regulators	16,296	+ 8,529
To Belgium	439	− 144
,, Luxemburg	159	− 653
,, Netherlands	720	+ 210
,, Sweden	495	− 158
,, Hungary	653	− 1,937
,, Norway	6,125	+ 5,960
Electromagnetic apparatus: Magnets	4,911	*
To Italy	526	*
,, Netherlands	552	*
,, Austria	359	*
,, Sweden	376	*
,, Switzerland	705	*
Primary cells and batteries	7,374	+ 2,007
To Finland	3	− 407
,, Sweden	551	+ 165
,, Turkey	3,128	+ 1,396
,, Iran	237	− 565
,, Denmark	450	+ 435
Accumulators	16,009	+ 454
To Turkey	2,398	− 50
,, Egypt	1,560	− 588
,, Netherlands	1,072	+ 171
,, Iran	845	+ 183
Elec. tools and machine tools	21,165	− 616
To Belgium	1,781	+ 425
,, Italy	2,052	+ 868
,, Netherlands	2,078	+ 415
,, Switzerland	2,180	+ 384
,, Hongkong	670	+ 213
,, Austria	1,458	+ 488
Vacuum cleaners and floor polishers, household	11,787	+ 2,638
To Belgium	2,047	+ 623
,, Italy	1,877	+ 618
,, Netherlands	1,303	+ 482
,, Sweden	422	− 423
,, Switzerland	939	+ 214
Washing, drying and wringing machines, household	26,276	+ 7,535
To Belgium	3,685	+ 2,261
,, Netherlands	6,861	+ 6,040
,, Norway	4,141	+ 2,975
,, Sweden	2,469	+ 1,624
,, Switzerland	2,457	+ 476
Fans up to 600 W	1,909	+ 604
To Italy	165	+ 30
,, Turkey	35	− 112
,, Switzerland	147	+ 80
Other household appliances up to 15 kg.	5,195	+ 1,912
To Belgium	1,022	+ 443
,, Italy	224	+ 63
,, Sweden	759	+ 361
,, Switzerland	340	− 316
,, Uruguay	639	+ 370
Shavers and hair cutters	4,554	+ 1,811
To Italy	322	+ 55
,, Netherlands	905	+ 480
,, Sweden	658	+ 166
,, Brazil	9	− 194
,, Argentina	583	+ 552
Ignition equipment for i.c., semi-diesel or diesel engines	14,778	+ 2,228
To Belgium	711	− 634
,, Italy	1,017	+ 572
,, Netherlands	1,115	+ 166
,, Austria	1,599	+ 469
,, Sweden	2,600	+ 963
,, Australia	1,065	+ 747
Elec., equipment, n.e.i., for cycles, motor cycles, motor vehicles, aircraft, ships or other vehicles	46,461	+ 4,672
To Belgium	3,129	− 98
,, Netherlands	5,299	+ 1,424
,, Sweden	11,238	+ 2,896
,, Indonesia	578	− 2,285
,, Malaya	686	− 1,823
,, Australia	5,227	+ 4,221
Elec. welding apparatus	13,001	*
To France	1,005	*
,, Italy	1,106	*
,, Netherlands	904	*
,, Turkey	561	*
,, Brazil	820	*
,, India	1,309	*
Elec. ovens, industrial and household	23,850	*
To Switzerland	3,987	*
,, Finland	1,683	*
,, Sweden	1,175	*
,, Japan	106	*
,, Brazil	1,060	*
Pressing irons	5,974	+ 791
To Belgium	502	− 82
,, Netherlands	555	+ 91
,, Turkey	381	− 28
,, Italy	519	+ 186
Other heating appliances and parts	16,153	+ 3,793
To Belgium	1,591	+ 246
,, France	688	− 169
,, Italy	1,495	+ 395
,, Switzerland	1,744	+ 307
,, Netherlands	1,369	+ 581
Portable electric lamps with batteries and the like	4,052	+ 65
To Yugoslavia	50	− 372
,, Netherlands	500	− 97
,, Turkey	195	− 583
,, China	717	+ 700
Radiological apparatus and accessories	40,065	+ 8,049
To Netherlands	1,718	+ 152
,, Turkey	1,313	+ 141
,, China	3,194	+ 2,781
,, Hongkong	6,413	+ 5,183
,, Argentina	3,486	+ 3,305
,, Brazil	3,639	+ 234
Electromedical, surgical and dental apparatus	15,802	+ 1,666
To Italy	1,118	+ 2
,, Denmark	1,078	− 291
,, Netherlands	1,120	+ 66
,, Hongkong	1,921	+ 1,716
,, Sweden	1,217	+ 360
Telephonic apparatus	46,216	+ 13,358
To Italy	14,565	+ 7,617
,, Pakistan	2,341	− 237
,, Nicaragua	1,309	+ 1,300
,, Argentina	2,277	+ 2,198
,, Netherlands	1,901	− 1,656
Telegraphic apparatus	15,465	+ 4,751
To Belgium	1,373	+ 257
,, Denmark	1,033	+ 727
,, Netherlands	1,677	+ 380
,, Sweden	1,260	− 346
,, Norway	1,563	+ 707
Microphones, amplifiers, loud-speakers, etc.	3,062	+ 830
To Sweden	409	+ 191
,, Switzerland	325	+ 125
,, Hungary	5	− 192
Elec. hearing aids	755	− 12
To Denmark	11	− 67
,, France	99	+ 21
,, Netherlands	77	− 40
,, Sweden	86	− 7
Radio apparatus	114,175	+ 36,883
To Belgium	12,640	+ 7,247
,, Italy	6,853	+ 5,730
,, Netherlands	17,713	+ 10,172
,, Switzerland	16,304	+ 9,208
,, Egypt	4,899	+ 2,424
,, Turkey	2,934	− 10,947
,, Indonesia	3,338	+ 634
,, Colombia	2,995	+ 779
,, France	3,439	+ 511
Echo-sounding apparatus and detectors	6,577	+ 700
To Denmark	1,401	+ 848
,, Norway	703	− 919
,, Portugal	343	− 369
,, Sweden	966	+ 207
Signalling and safety apparatus	5,246	+ 453
To Belgium	347	− 71
,, Switzerland	466	+ 162
,, Greece	103	− 348
,, Netherlands	623	+ 197
Elec. condensers	8,308	+ 3,937
To Netherlands	1,545	+ 1,068
,, Sweden	601	+ 136
,, Austria	626	+ 310
Switchgear	74,256	+ 6,039
To Saar	3,517	− 1,137
,, Belgium	4,138	+ 638
,, Italy	4,040	+ 204
,, Yugoslavia	11,689	+ 2,389
,, Netherlands	7,510	+ 2,133
,, Austria	3,224	− 1,618
,, Sweden	3,478	− 2,850
,, India	2,688	+ 1,252
Cable	68,979	− 3,306
To Luxemburg	3,446	− 154
,, Finland	120	− 3,994
,, Yugoslavia	3,546	− 2,845
,, Sweden	7,250	− 2,478
,, Netherlands	4,637	+ 3,214
,, Norway	4,575	+ 911
,, Egypt	4,492	+ 2,219
Insulated wire, flex, etc.	42,961	+ 5,774
To Sweden	4,162	− 704
,, Colombia	2,657	+ 1,486
,, Uruguay	2,230	+ 599
,, Venezuela	3,576	+ 2,115
,, Soviet Union	3,081	+ 3,000
Elec. lamp bulbs and tubes	16,137	+ 3,065
,, Belgium	1,050	+ 446
,, Netherlands	900	− 96
,, Norway	1,781	+ 731
,, Sweden	2,309	+ 518
,, Chile	206	− 327
,, Argentina	1,922	+ 1,491
Thermionic or electronic tubes and valves (not for lighting)	12,579	+ 3,559
To Denmark	606	− 321
,, Italy	2,012	+ 821
,, Netherlands	2,390	+ 784
,, United Kingdom	1,340	+ 1,098

* Comparative figures not available.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 29th September from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1949

23081. Postmaster General. — Electrical communication switching systems. 21st August, 1950. (716171.)

1950

1348. Soc. d'Electronique et d'Automatisme.—Correction of coded electric signals. 18th January, 1950. (716172.)

6028. Electric & Musical Industries, Ltd.—Electron-beam discharge devices. 12th March, 1951. (716173.)

9687. Electric & Musical Industries, Ltd.—Cathode-ray tube envelopes. 19th April, 1951. (716174.)

12581. Ateliers de Constructions Electriques de Charleroi.—Electric discharge lamps. 19th May, 1950. (716176.)

27493. Burnley Aircraft Products, Ltd.—Clothes washing machines. 11th May, 1951. (716113.)

29328. Delapena & Son, Ltd.—High frequency electric induction heating systems. 14th November, 1951. (716114.)

1951

6247. Simplex Electric Co., Ltd.—Steaming ovens. 12th March, 1952. (716118.)

7889. Standard Telephones & Cables, Ltd.—Electrically conducting cements. 28th March, 1952. (716243.)

8138. Johnson & Co., A.—Treatment of electrical apparatus. 9th April, 1951. (716029.)

8923. S.M.D. Manufacturing Co. (Proprietary), Ltd.—Discharge lamp ballast units. 17th April, 1951. (716275.)

9531. Hoover, Ltd., and Dunn, H. G.—Clothes washing and wringing machines. 22nd April, 1952. (716245.)

10459. Soc. d'Electronique et d'Automatisme.—Electric circuits for producing or combining coded impulse trains. 3rd May, 1951. (716246.)

13291. Gilfillan Bros., Inc.—Radar system. 5th June, 1951. (716122.)

13657. Standard Telephones & Cables, Ltd.—Electrical semi-conducting devices. 8th June, 1951. (716250.)

16113. General Electric Co., Ltd.—Voltage indicating means. 2nd July, 1952. (Addition to 606502.) (716125.)

16514. Weil, V., and Heberer, W.—Electric accumulators. 12th July, 1951. (716189.)

17266. Standard Telephones & Cables, Ltd.—Electrically conducting adhesives. 11th July, 1952. (716253.)

19965. Loewe, S.—Magnetic sound recording apparatus. 24th August, 1951. (716193.)

20409. Cinema-Television, Ltd.—Direct-voltage stabilizer circuits. 28th August, 1952. (716278.)

20862. British Thomson-Houston Co., Ltd.—Automatic tension control for electric reel motor control systems. 7th July, 1952. (716129.)

22399. Philips Electrical Industries, Ltd.—Electric impedance networks. 25th September, 1951. (716257.)

23993. Nagard, Ltd.—Electronic input circuits for electrical measuring instruments. 30th September, 1952. (716037.)

24045. Cossor, Ltd., A. C.—Pulse radar systems. 16th September, 1952. (716197.)

26725. Licentia Patent-Verwaltungs Ges.—Pre-exciting circuit for saturable switching reactors in contact rectifier circuits. 14th November, 1951. (716279.)

27001. Loewe Opta Akt.-Ges.—Electric-discharge tube for emission of visible light. 16th November, 1951. (Addition to 701589.) (716201.)

27640. Heinrich, D. O.—Charging zone of two-stage electrostatic precipitators. 26th November, 1951. (716258.)

28498. Clevite Corporation.—Ceramic dielectric material. 5th December, 1951. (716046.)

29309. Weyandt, C. S.—Electromagnetic reciprocating motors. 14th December, 1951. (716049.)

30106. Reyrolle & Co., Ltd., A.—Electric switch-contact structures. 17th December, 1952. (716050.)

1952

434. National Research Development Corporation.—Voltage stabilization circuits. 6th January, 1953. (716282.)

725. Staatsbedrijf der Posterijen Telegrafie en Telefonie.—Electronic line circuit with calling-line excluding facilities. 9th January, 1952. (716141.)

1257. Cianchi, A. L. G.—Electrical condensers. 15th April, 1953. (716259.)

3473. Crabtree & Co., Ltd., J. A., and Morgan, R. W.—Electric tumbler switches for alternating current circuits. 22nd December, 1952. (716143.)

3692. British Thomson-Houston Co., Ltd.—Sound reproduction. 1st January, 1953. (716055.)

4091. English Electric Co., Ltd.—Plug and socket connectors for electrical apparatus. 13th February, 1953. (716284.)

4205. Saint Freres Soc. Anon.—Current supply means for weft stop motions. 18th February, 1952. (716056.)

4530. Marconi's Wireless Telegraph Co., Ltd.—Radio communication systems. 3rd February, 1953. (716285.)

7383. Standard Telephones & Cables, Ltd.—Magnetic sound recorders and reproducers. 21st March, 1952. (716147.)

7566. Poor & Co.—Electroplating method and compositions. 24th March, 1952. (716212.)

8530. Philips Electrical Industries, Ltd.—Electric-discharge tubes for use with short wavelengths. 3rd April, 1952. (716062.)

11205. Hoover, Ltd.—Suction cleaners. 2nd May, 1952. (716150.)

11763. Westinghouse Electric International Co.—Electric circuit interrupters. 9th May, 1952. (716218.)

11834. Bendix Aviation Corporation.—Transducers. 9th May, 1952. (716065.)

14878. Fruengel, F.—Method for high-frequency soldering or induction hardening. 12th June, 1952. (716298.)

16110. Civilforsvarsstyrelsen. — Apparatus for integrating measurement of X-rays or radioactive rays. 26th June, 1952. (716221.)

19896. Scholes & Co., Ltd., G. H., and Pearce, F. J. — Metalclad electric fuse boards or boxes. 8th July, 1953. (716302.)

22096. General Electric Co.—Electro-luminescent materials. 2nd September, 1952. (716159.)

23822. Glossl, K. Schaffler- (trading as Schaffler & Co.).—Winding and release device for dynamo-electrical ignition machines. 23rd September, 1952. (716305.)

24980. Philips Electrical Industries, Ltd.—Cathode-ray tubes. 6th October, 1952. (716162.)

25251. General Electric Co.—Examination of gaseous mediums for minute particles suspended therein. 8th October, 1952. (716163.)

25732. General Electric Co.—Insulation for electrical conductors. 14th October, 1952. (716087.)

27431. General Electric Co.—Control systems for electrically-driven waste disposal apparatus. 31st October, 1952. (716089.)

27436. Standard Telephones & Cables, Ltd.—Television receiver. 31st October, 1952. (716165.)

28067. Westinghouse Electric International Co.—Electromagnetic contactors. 7th November, 1952. (716090.)

28771. Philips Electrical Industries, Ltd.—Disc-shaped ceramic capacitors. 14th November, 1952. (716094.)

28972. General Electric Co.—Thermally-responsive snap-action electric switches. 17th November, 1952. (716096.)

30700. Siemens & Halske Akt.-Ges.—Electro-magnetic indicator signal for telecommunication purposes. 3rd December, 1952. (716167.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to the dates stated:—

28th August

GUARDALOY. No. 729,073, Class 9. Anodes, terminal connectors for making electrical connections to pipes, to building and engineering structures and to anodes, junction boxes, electric current collecting devices, voltmeters, ammeters, etc., earthing devices, for use in the cathodic protection of metallic structures against corrosion; and housings for such electrical devices.—F. A. Hughes & Co., Ltd., Devonshire House, Mayfair Place, Piccadilly, London, W.1.

FREQUISTOR. No. 730,320, Class 9. Electrical resistances and electrical apparatus included in Class 9 incorporating electrical resistances.—Belling & Lee, Ltd., Great Cambridge Road, Enfield, Middx.

CALORA. No. B728,587, Class 9. Electrically heated pads and blankets. — M. Platt, Underbank Hall, Charlestown, Hebden Bridge, Yorks.

BEL-STAT. No. 729,934, Class 9. Electrically heated blankets and pads for medical and surgical use.—H. D. Smith and H. J. Cronhelm, trading as Belmont Manufacturing Co., 7, James Street South, Belfast.

BARPRO. No. 729,199, Class 11. Lamps and lamp bulbs.—Barrington Products (Leicester), Ltd., 48, Bank Street, Leicester.

4th September

AUTOLINE. No. B724,418, Class 9. Electrical apparatus for use in the control of electric motors.—Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Tyseley, Birmingham, 11.

AUTRONIC. No. 727,551, Class 9. Thermionic valves. — Plessey Co., Ltd., 56, Vicarage Lane, Ilford.

SIGLARM. No. 730,318, Class 9. Electro-acoustic alarms for attachment to bags, cases and the like.—A. H. Kisch, 11, Regency Square, Brighton, 1, Sussex.

ARCHIVE. No. 730,861, Class 9. Instruments and apparatus for recording, reproducing or amplifying sound, etc., and parts, but not including electrical relays.—Deutsche Grammophon G.m.b.H., Hanover, Germany. Address for service: c/o H. D. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

DANDA. No. 729,683, Class 11. Handlamps.—S. Thomas Fry, I. Brimble, and K. Vincent, trading as D. and A. Accessories (Birmingham), Brades Farm Works, Roway Lane, Oldbury.

CONDITIONS IN SWEDEN

Opportunities for British Electrical Exporters

IN 1952 Sweden was Britain's best customer on the Continent and her eighth most important in the world. A survey of economic and commercial conditions in that country, prepared by the Board of Trade and published by H.M. Stationery Office at 6s 6d (post free 6s 9d), states that with over 90 per cent of imports free from restrictions, the Swedish market is wide open to British exporters. Competition, especially from Western Germany, is, however, growing in intensity and British exporters wishing to retain their hold on the market will have to redouble their efforts to study and satisfy Swedish requirements. Energetic sales methods will be necessary, firm and competitive prices must be quoted, and special attention will have to be paid to the fulfilment of contracts on time and to the improvement of servicing facilities. Closer personal contact with Swedish importers will be required and only goods of first class quality stand a chance of success.

The development of hydro-electric power in Sweden is making rapid strides. Generation of electric power now exceeds two and a half times the pre-war level and on the basis of present plans expansion of output may be expected to continue at a rapid rate during the next five or six years. Next to Switzerland and Norway, Sweden now has the third highest rate of consumption in relation to its population. It is estimated that consumption is increasing at the rate of 1,200 million kWh per annum. In towns and the more populous localities electricity is now available to practically everyone. In rural districts over 87 per cent of homes are now electrified and electricity is available to almost all farms.

The exploitation of Sweden's abundant hydro-electric power resources has led to the development of an important electrical equipment industry. The chief manufacturer in this branch is Allmänna Svenska Elektriska A.B. (ASEA), which has 29,000 employees and is Sweden's biggest industrial undertaking, making a very wide range of electrical products. The production of telephone and telegraph equipment, signalling, radar and other communication apparatus is largely in the hands of the Telefon A.B. L. M. Ericsson and its subsidiaries.

Keen Competition

Competition from domestic manufacturers is keen and will be encountered in most kinds of electrical and telephone engineering products. Nevertheless, among a wide range of imported electrical products which have found a market in Sweden may be mentioned generators and motors; transformers; underground power cables and telephone cables; starting, regulating and reduction resistances; safety and excess voltage apparatus; certain high voltage switchgear; insulators; junction boxes; and battery parts.

A large part of the demand for commercial electrical equipment is met locally, although there is a fair amount for many kinds of imported machines, including pumps, compressors, drills, ventilating equipment, knitting and stitching machines, refrigerating equipment, fluorescent lamps and ancillary equipment. There is a growing interest in X-ray equipment for use in industry but at present the demand is rather small.

The market for domestic electrical appliances is large but conditions are rather special. Many blocks of modern flats are fitted out with locally produced cookers, hotcupboards for food, built-in refrigerators and central heating. Most of these flats also have a communal wash room fitted with a washing machine and centrifugal dryer. In spite of strong Swedish competition the United Kingdom has taken a useful share of the market for washing machines, vacuum cleaners, fans and refrigerator parts. Among items of interest to importers may be mentioned domestic food mixers, thermostatically controlled irons, shavers, clocks and hair dryers.

The market for domestic radio receivers and radiograms is met almost entirely by local production. There is, however, a considerable demand for high quality components, though strong competition can be expected from local producers. Television transmissions are at present being made experimentally from Stockholm. The large Swedish radio manufacturers are preparing to go into production with receivers as soon as full-scale transmissions commence some time this year. The general European system of 625 lines is being adopted. Here again a considerable demand for components is anticipated.

Among electromedical equipment there is a demand for certain radiological equipment, diagnostic apparatus, and electrotherapy, massage, etc., machines; special instruments are also imported, such as encephalographs. Hearing aids and components also enjoy relatively good sales, competition being very keen with manufacturers from the U.S.A., Holland, Denmark and Germany. A Swedish hearing aid is also now being sold. Although X-ray apparatus and tubes of excellent quality are produced locally, a fair demand exists for certain imported equipment which the U.S.A. and Western Germany mostly supply.

Other imported products which have found a useful market are high frequency heaters and high voltage electronic control equipment.

Cape Town Costs and Charges

THOUGH the price of coal supplied to Cape Town's power stations was increased by 2s 5d a ton on 1st August, domestic tariffs in the municipal area are not being raised. The extra expense will be met from the £200,000 special stabilization fund created last year out of surpluses to meet such contingencies. Industrial users who have a special coal clause in their agreements with the Council will, of course, have to pay more and consumers on the Electricity Supply Commission network will also be faced with an increase.

In the first four months of this year the Cape Town Electricity Department had an estimated surplus of £72,274, according to a report by the city electrical engineer, Mr. C. G. Downie. The report (written before the increased railway tariffs affecting coal supplies were announced) said that the estimated surplus of £279,521 for the whole year would probably be achieved " provided no unforeseen expenditure or serious fall off in revenue occurs."

The servicing for three years of electrical goods bought under the municipal hire-purchase scheme will be replaced by a system in which apparatus is guaranteed for only a year, if a proposal considered by the Cape Town Electricity Committee is adopted. Under the present system the Council replaces parts of apparatus which have become faulty within 36 months of purchase; there is also a final inspection of the goods at the end of three years, whether the apparatus is faulty or not. Under the proposed scheme all servicing will be done by distributors, who will guarantee the apparatus for a year. Last year the Council sold 3,032 appliances with a cash value of £195,640. Discounts, at 15 per cent, were £29,346, and the cost of running the scheme was £25,735, leaving a profit to the Council of £3,611. The costs included a payment of £12,500 to the hire-purchase maintenance reserve fund. If the 1953 sales had been conducted on the new basis, it is estimated that the profit to the Council would have been £8,454.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—MELBOURNE.—8th September. State Electricity Commission of Victoria. Low voltage switchgear. (E.S.B. 19351/54. Ten/10250.)*

SYDNEY.—6th September. Electricity Commission of New South Wales. Metalclad switchgear. (E.S.B. 15918/54. Ten/10251.)*

Belfast.—10th September. Electricity Committee. Fire extinguishing equipment. (See this issue.)

Belgian Congo. — LEOPOLDVILLE. — 16th November. Ministry of Colonies, Brussels. Electricity distribution plant at the new airport. (E.S.B. 19754/54. Ten/10307.)*

Brazil.—BELEM.—1st September. Ministry of Transport and Public Works. Cold storage plant for the Servicos de Navegacao da Amazonia e de Administracao do Porto de Para. (E.S.B. 19787/54. Ten/10316.)*

British East Africa.—NAKURU.—1st September. Municipal Council. Street lighting equipment. (E.S.B. 19729/54. Ten/10302.)*

Canada. — WINNIPEG. — 7th September. Manitoba Hydro-Electric Board. Surface condensers and auxiliaries. (E.S.B. 19506/54. Ten/10283.)*

Durham.—25th August. County Council. Electrical installation in old people's hostel, Crook. County architect, Court Lane, Durham.

Greece. — ATHENS. — 4th September. Director of Public Works, General Air Staff, 15, Filellinon Street, Athens. Eighteen stand-by generators for Larissa, Nea Ankialos and Eleusis Airfields. (E.S.B. 19477/54. Ten/10267.)*

India. — CALCUTTA. — 2nd September. Damodar Valley Corporation. Control panels for the Maithon left and right bank substations. (E.S.B. 19365/54. Ten/10218.)*

HYDERABAD.—Central Stores Purchase Branch. Power conductors and accessories. (E.S.B. 19794/54. Ten/10314.)*

MADRAS.—2nd September. Electricity Department, Government of Andhra. Insulators and accessories including suspension and tension clamps for the earth wire and vibration dampers for a.c.s.r. conductor. (E.S.B. 19377/54. (Ten/10235.)*

Irish Republic.—DUBLIN.—City Vocational Education Committee. Electrical installations in new technical school for girls, Crumlin Road. Sean Mulcahy, consulting engineer, 70, Merrion Square, Dublin. (E.S.B. 19048/54. Ten/10232.)*

Kettering.—30th August. Town Council. Street lighting. (See this issue.)

Lincoln.—10th September. County Council. Heating, hot and cold water, ventilation, and electrical installations. (See this issue.)

Mitcham.—4th September. Town Council. Street lighting improvements. (See this issue.)

New Zealand.—AUCKLAND.—10th September. Auckland Electric Power Board. Aerial cable and binder wire. (E.S.B. 19755/54. Ten/10306.)*

WELLINGTON. — 29th September. Stores Division, General Post Office. Protectors and fuses. (E.S.B. 19297/54. Ten/10257.)*

Peterlee (Durham).—13th September. Development Corporation. Electrical installations in 310 houses on the Acre Rigg estate. Chief architect, Shotton Hall, Castle Eden.

Plympton St. Mary.—27th September. R.D.C. Seven sets of electrically driven vertical unchokeable sewage pumps, with equipment. John Taylor & Sons, Artillery Row, Victoria Street, London, S.W.1.

Rothwell.—4th September. U.D.C. Street lighting, Oulton. (See this issue.)

Salford.—4th September. City Council. Motor tower wagon. (See this issue.)

South Africa. — JOHANNESBURG. — 1st September. Stores Department, South African Railways. 600 V and 6·6 kV cable. (E.S.B. 19125/54. Ten/10219.)* 8th September. 18,000 wedges for armature coils. (E.S.B. 19275/54. Ten/10263.)*

PRETORIA.—9th September. Union Tender and Supplies Board. Radio valves. (E.S.B. 19373/54. Ten/10262.)* 16th September. Twenty automatic charging 24 V, 5 A rectifiers. (E.S.B. 19859/54. Ten/10304.)*

United States.—PORTLAND, ORE.—1st October. U S. Army Corps of Engineers. Generators for Dallas Dam power house. (E.S.B. 19540/54. Ten/10309.)*

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769.)

ORDERS PLACED

Bournemouth.—Highways and Works Committee. Recommended. Sodium vapour street lighting units (40) for main road lighting (£2,200).—G.E.C.

Chester.—City Council. Recommended. Electrical installations in 142 houses at Blacon (£3,263).—Engineering Service Installation, Ltd.

Keynsham.—U.D.C. Electrical installations in 114 houses and 10 bungalows on the Park West estate (£2,275).—Central Electric Co.

Middlesbrough. — Tees Valley Water Board. Electrical equipment for the Low Worsall pumping station (£2,656).—North Eastern Electricity Board.

Ossett.—Town Council. Accepted. Street lighting.—Cohen Bros. (Electrical), Ltd., Manchester.

Ryton-on-Tyne.—U.D.C. Rewiring of 218 houses at Crookhill, Ryton and Crawcrook. —J. L. Morley.

Sheffield. — Corporation. Recommended. Electrical installation work at Hinde House Secondary School (£6,935). — Radcliffe Electric. Installation work at Silverdale Secondary School (£8,164).—Tinsley Electric Co.

Southall. — Corporation. Recommended. Improved street lighting in Uxbridge Road (£8,116).—Eleco, Ltd.

Welwyn Garden City.—Electrical installations in 288 dwellings at Hatfield Hyde.—Stevenage Electrical Engineering Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashford (Middx.).—Nurses' home, Ashford Hospital; North West Metropolitan Regional Hospital Board, 11, Portland Place, London, W.1.

Bangor.—Houses (52) at Maesgeirchen Estate for T.C. (£72,592); Edward Jones, 3, The Arcade, Penmaenmawr.

Blackpool.—Factory extensions, Vicarage Road; Burtons Gold Medal Biscuits, Quality House, Vicarage Road, South Shore.

Blyth.—Houses in Laverock Road (41), Newsham Road (24), Delsval Terrace (24) and Patterdale Road (29) for the T.C.; D. W. Foster, borough engineer.

Boston.—New county offices for Holland County Council in London Road (estimated cost £47,000); county architect.

Brentford.—Houses (80), Carville Crescent; borough engineer.

Carlisle.—Additions to the radiography department at Cumberland Infirmary (£15,000); J. Millar & Sons, builders, London Road.

Nurses' recreation hall at Cumberland Infirmary (£19,400); John Laing & Sons, builders, Dalston Road, Carlisle.

Colchester.—Houses (86), Monkwick estate; borough surveyor.

Coseley.—Houses (48), on Ettingshall Park Farm Estate; J. C. Roper, clerk to U.D.C., Council House.

Coventry.—Rebuilding central hostel at The Butts, for Y.W.C.A.; secretary, Local Offices, 16, Queen's Road.

Crewe.—County grammar school for girls (£196,338), for County E.C.; J. G. Kellett, director of education, City Road, Chester.

Croydon.—Flats (44), at Heathfield Road, and 24 flats at Kingsdown Avenue; E. Taberner, town clerk, Town Hall.

Deeping St. James.—Secondary school for Kesteven County Council; county architect, Sleaford, Lincs.

Durham.—Housing developments on 530 acres at Framwellgate Moor for the City Council; J. W. Green, city engineer.

Ealing.—Operating theatre at King Edward Memorial Hospital, Mattock Lane; C. D. Andrews, architect, 3, Sheffield Street, W.C.2.

Evesham.—Houses (42) and 20 flats at Fairfield for T.C.; Wheeler & Mansell, Ltd., Lime Street.

Gateshead.—Seven years' building programme for the T.C. (4,850 houses); borough engineer.

Harlow. — Dwellings (167), Netteswell Road; Harlow Development Corporation, Terlings, Gilston.

Hove.—Houses on 50-acre site at Hangleton Manor, 4; T. J. Braybon & Son, Ltd., builders, Princes House, North Street, Brighton, 1.

Keighley.—Baptist Church at Bracken Bank; architects, Lunn & Lunn, Milnsbridge, Huddersfield.

Lanchester.—Houses (40), at Hamsteels; R.D.C. surveyor.

London.—STEPNEY.—Garage and offices, Mile End Road; Demolition & Construction Co., Ltd., 3, St. James's Square, S.W.1.

WESTMINSTER. — Rebuilding St. John's Church, Smith Square; John Atkinson, architect, 13, Manchester Square, W.1.

Longbenton.—Factory buildings, laboratory, canteen, etc., for Thomas Hedley & Co., Ltd., detergent manufacturers, City Road, Newcastle-on-Tyne (£350,000); firm's own architect.

Middlesbrough.—Factory, Snowdon Road, for Middlesbrough and District Hide & Skin Co., Ltd.; W. E. Schumm, architect, 49, Albert Road.

Reading.—New factory on the Manor Farm site; Firestone Tyre & Rubber Co., Ltd., Great West Road, Brentford.

Ripon.—Agricultural implement factory Bondgate area; Glovers of Ripon, agricultural engineers, 91, Leeds Road South, Harrogate.

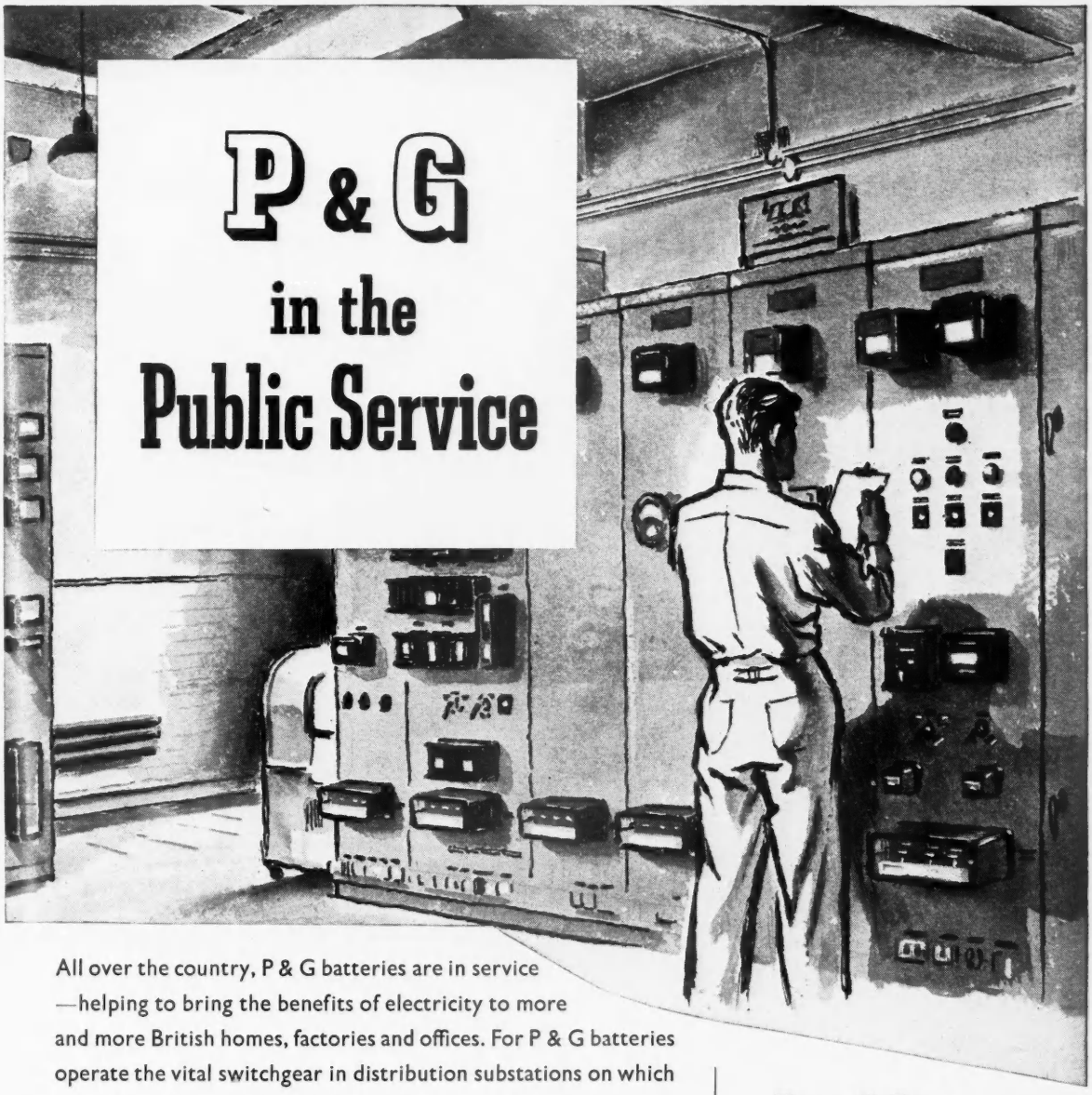
Sunderland.—Conversion of tramsheds for use as bus repair central workshops (£37,700); borough architect.

Dwellings (217), Grindon Village estate; borough architect.

Walsall.—Houses (60), on the Gipsy Lane estate, for Housing Committee; M. E. Habershon, borough surveyor, Council House.

Weston-super-Mare. — Rebuilding St. Paul's Church; Fry, Paterson & Jones, architects, Waterloo House, Waterloo Street.

Windsor.—Houses (82), Old Windsor Road; Taylor Woodrow Homes, Ltd., Taywood Road, Greenford.



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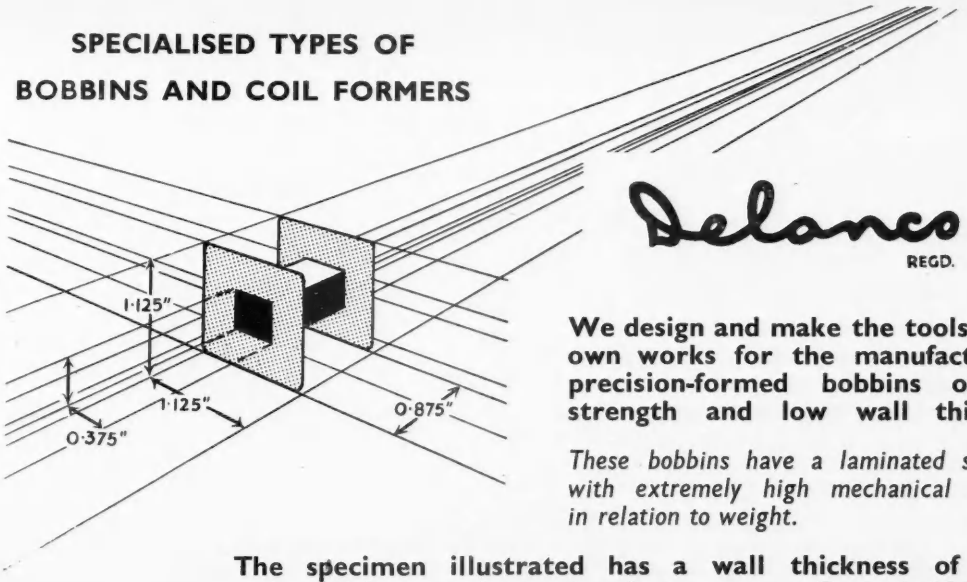

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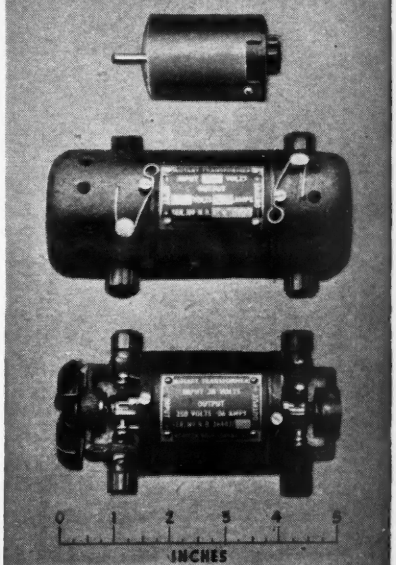

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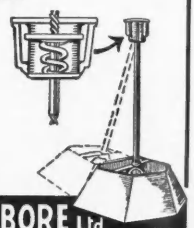

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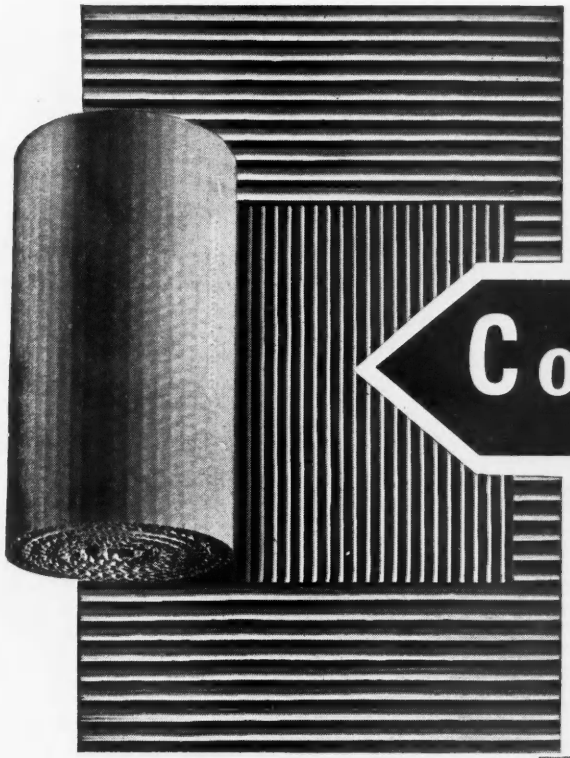

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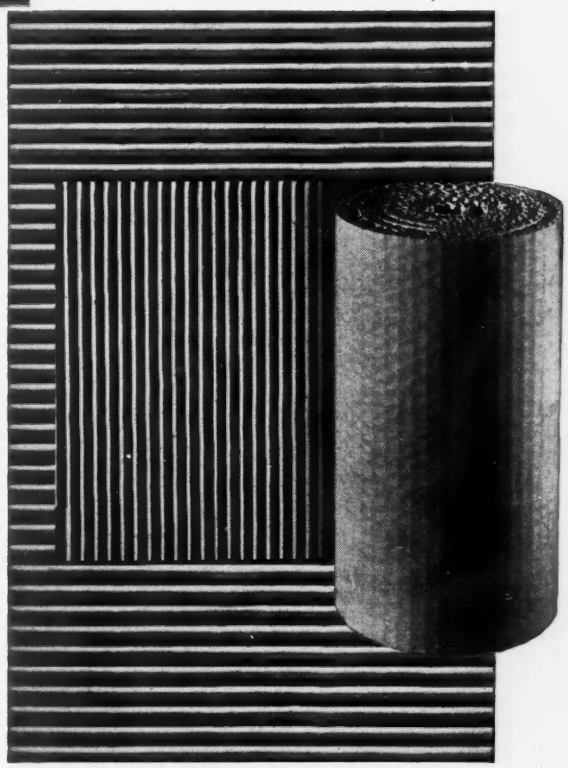

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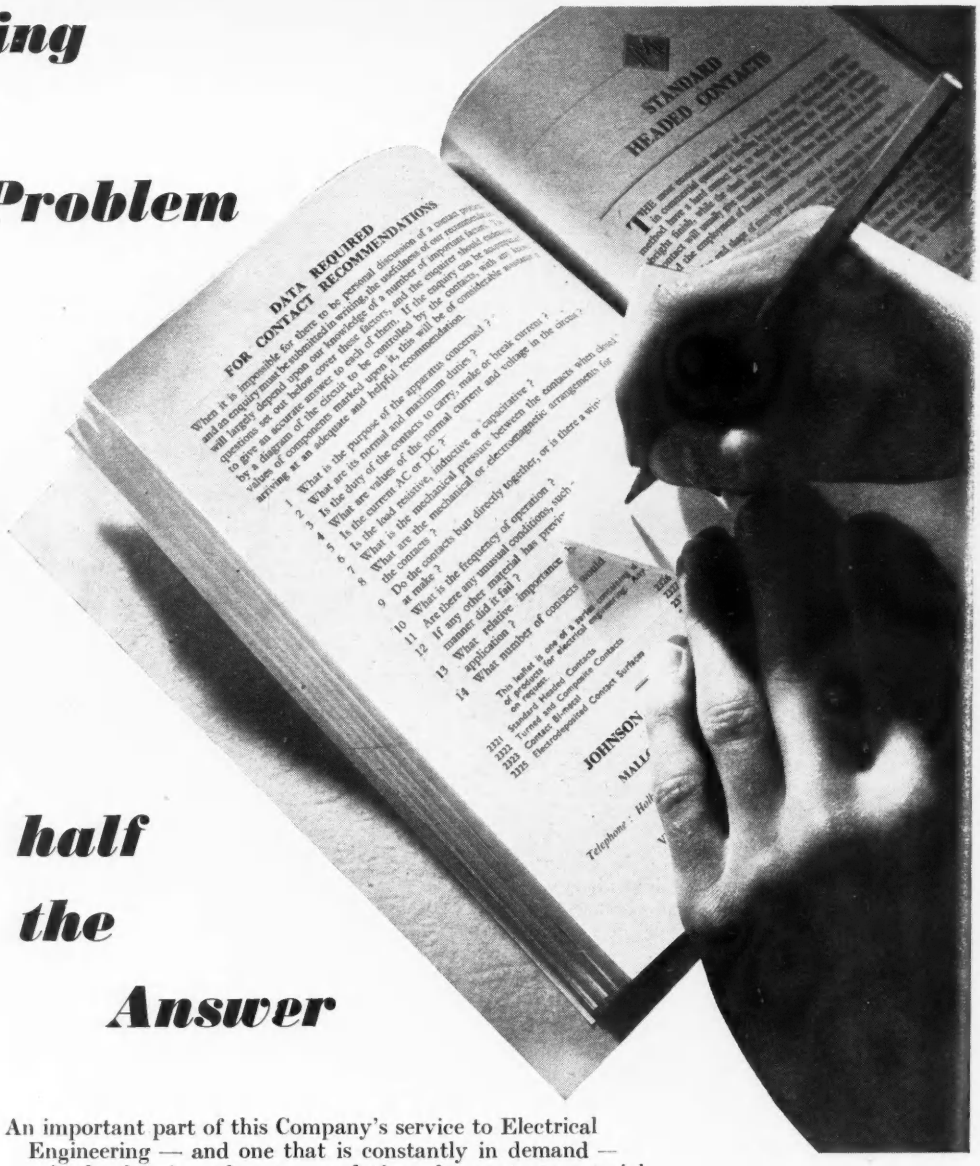

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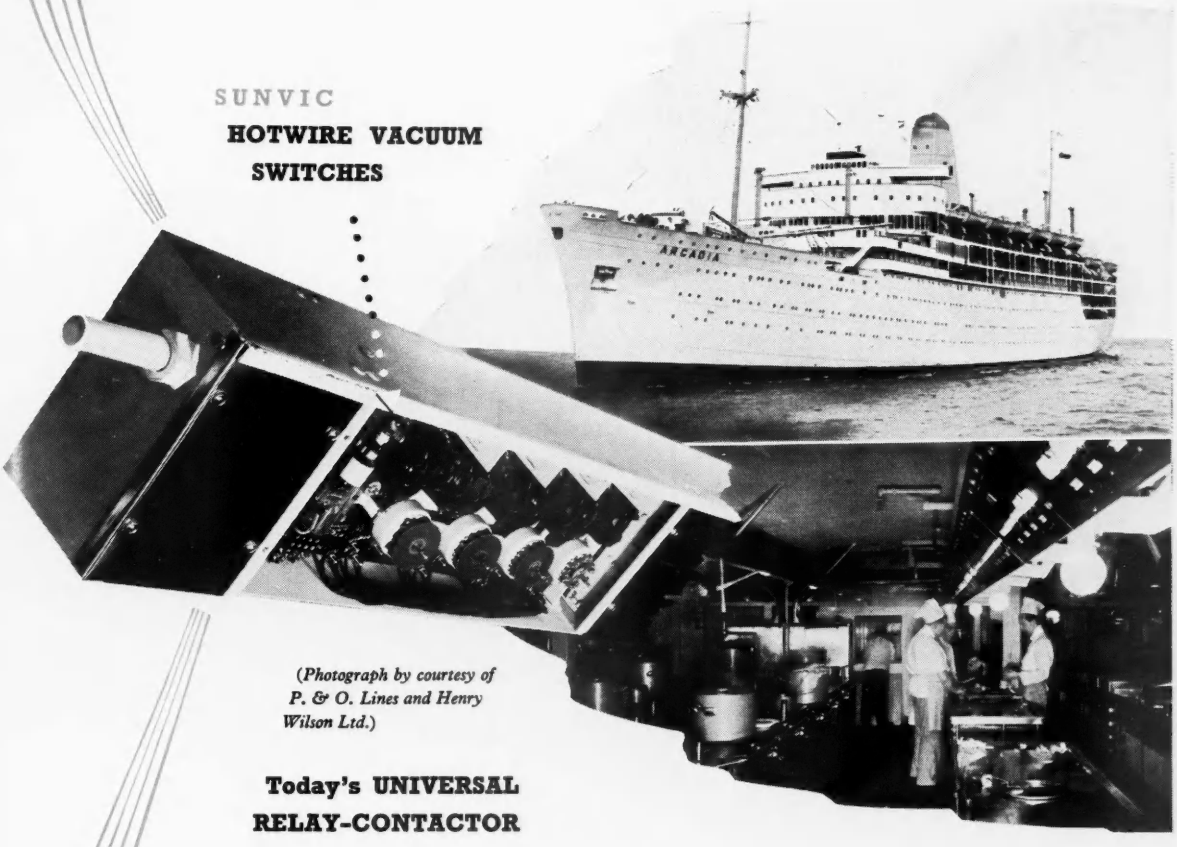

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The controls for the 18 ovens in the galley of S.S. "Arcadia" incorporate Sunvic Hotwire Vacuum Switches. Another example of the use of Sunvic instruments where reliability is essential. H.V.S. relays are used in many such applications where long, trouble-free service is of vital importance—at sea (protection of fresh water supplies), in the air (de-icing equipment) and on land (from approach radar to thermostatically controlled cots for premature babies).

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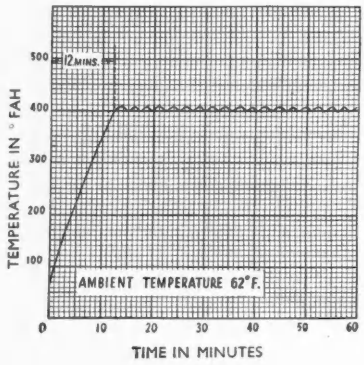

Yes, this new "Luxury" C.90 will be a quick seller—particularly when the purchaser knows that an exclusive Pyrex heat-resisting glass casserole/grill pan, a heated drawer, and an 8 radiant plate with simmer control are all included for the moderate price of £48.

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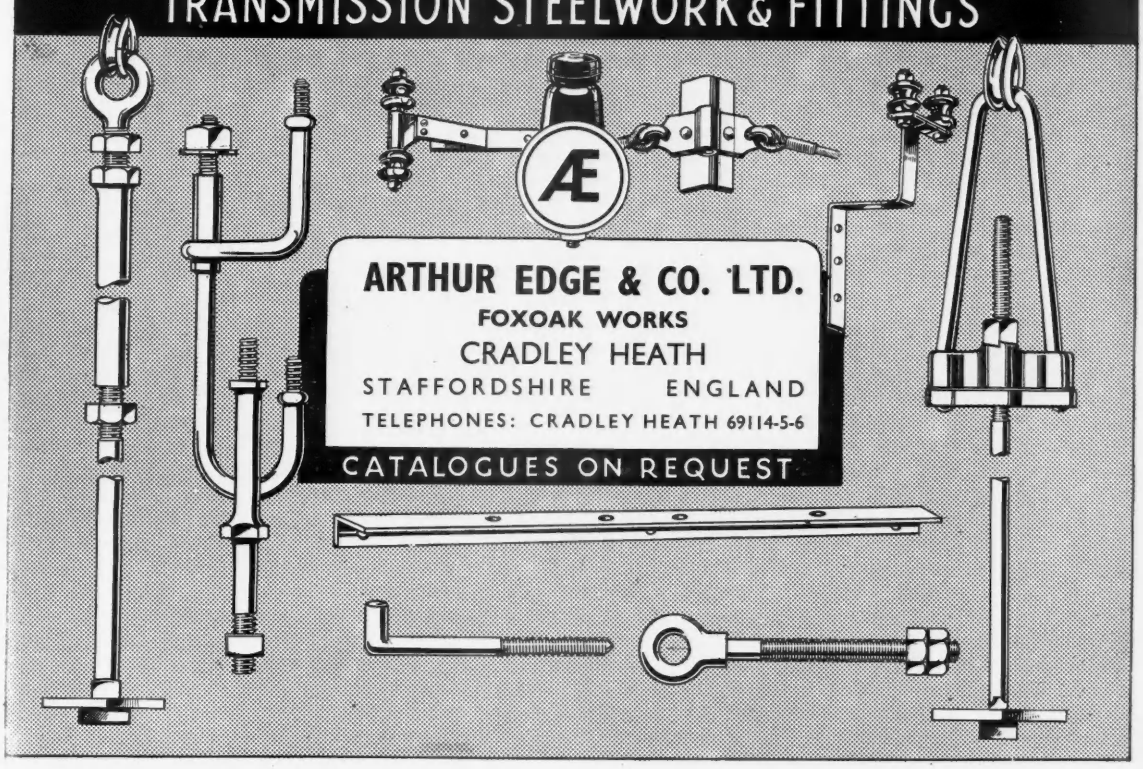

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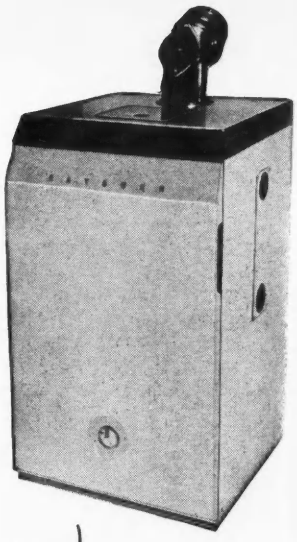

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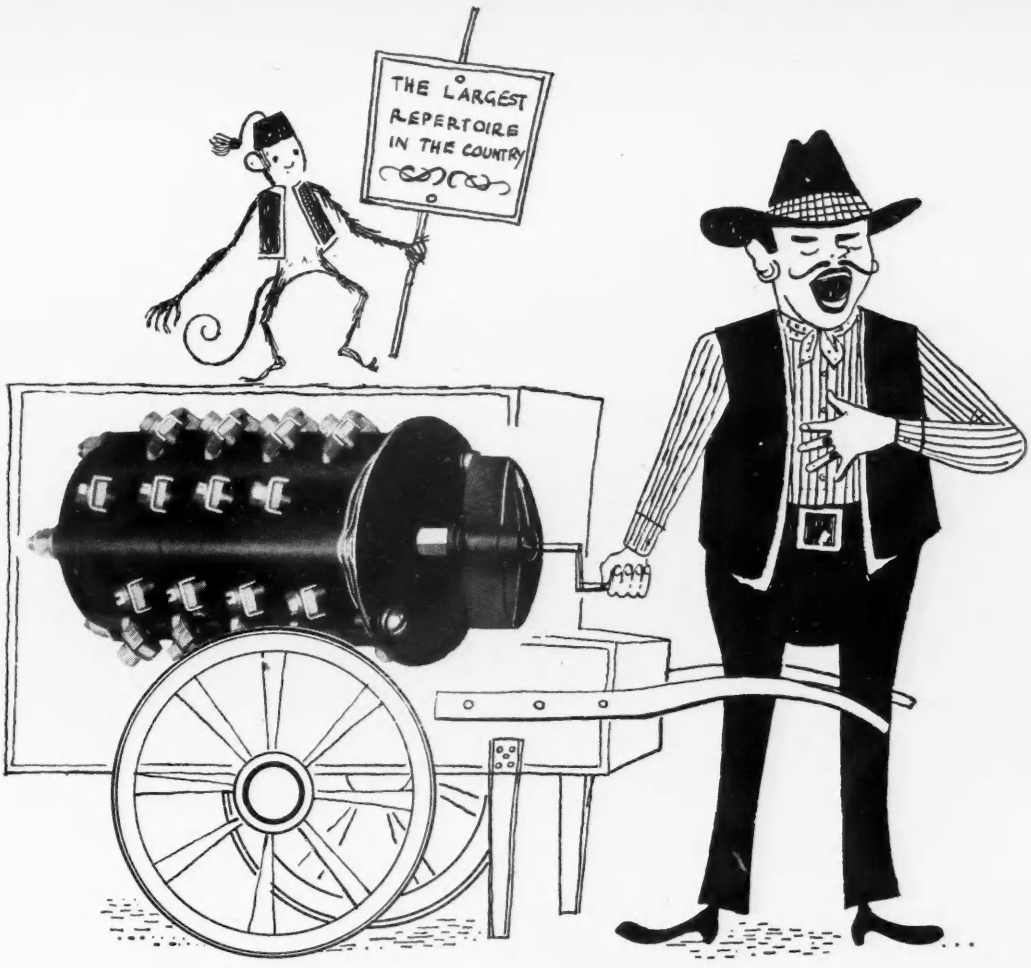

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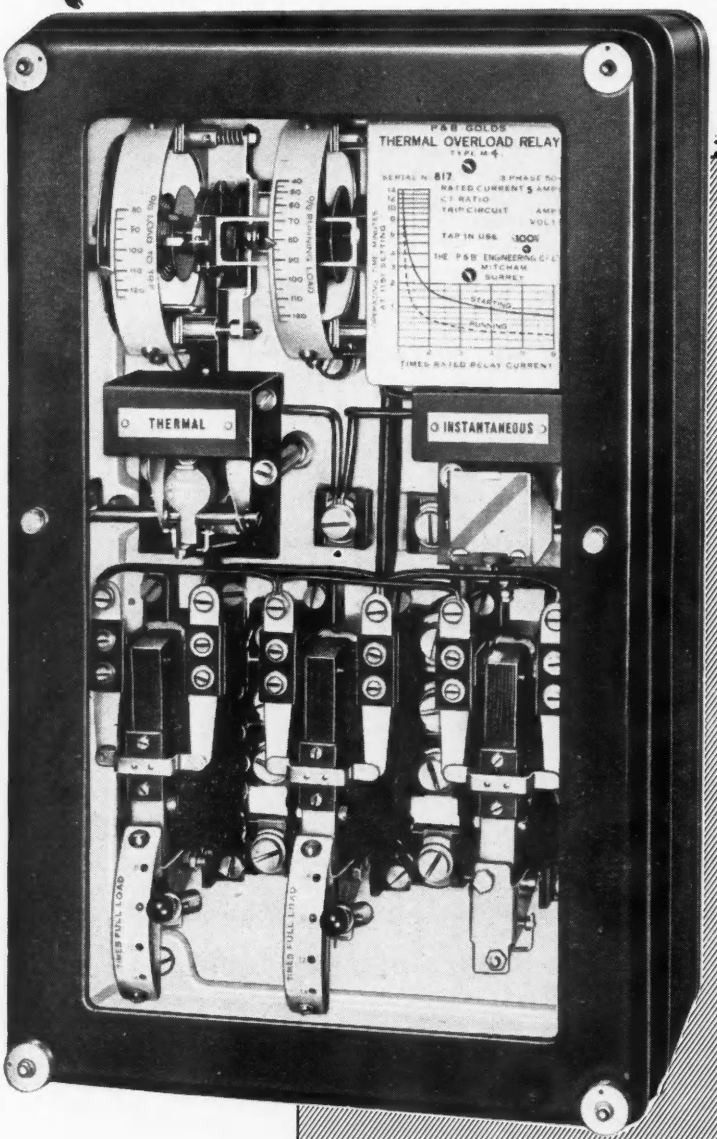

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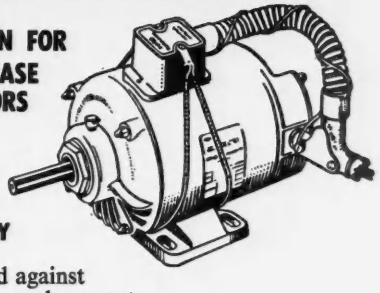

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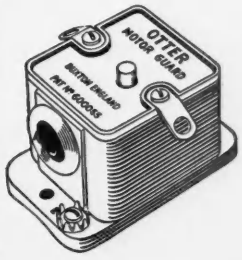

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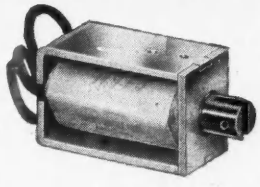

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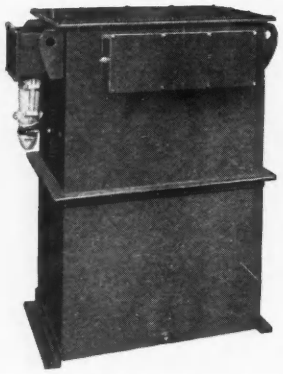

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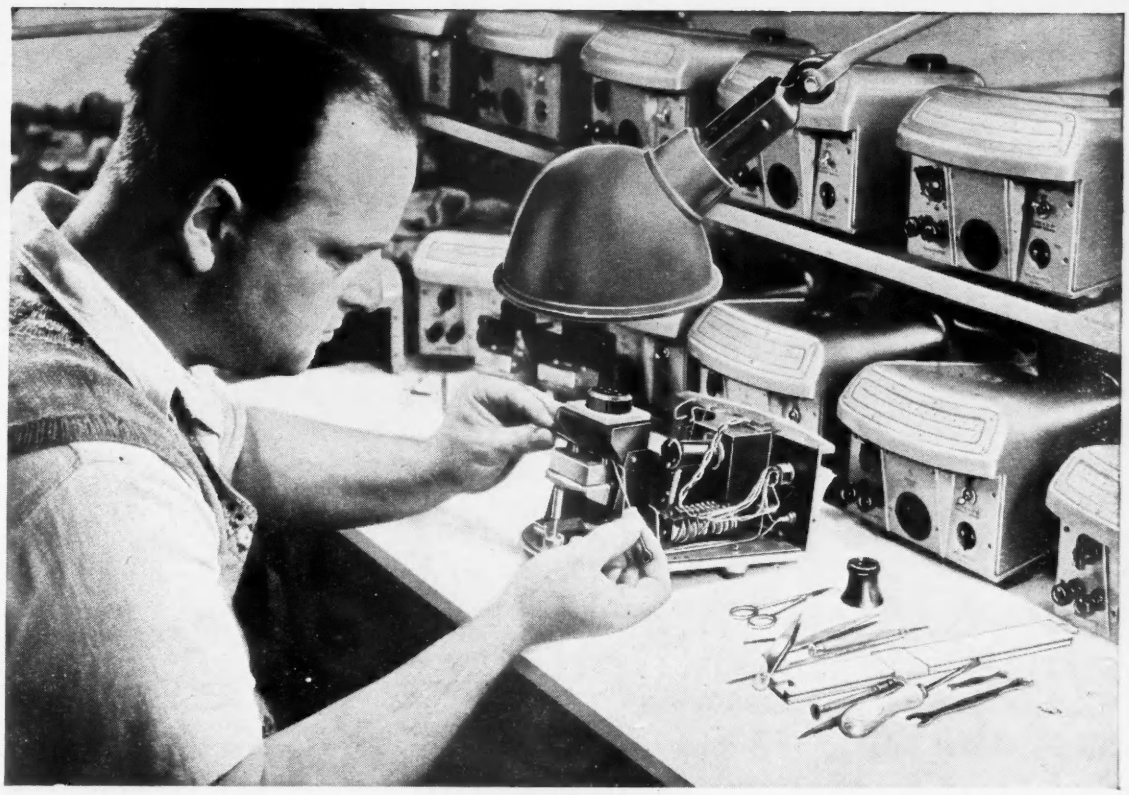

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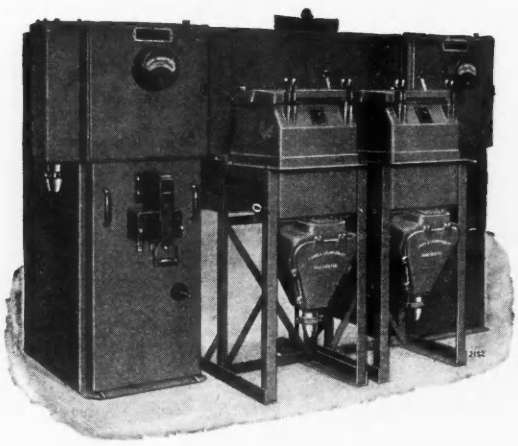

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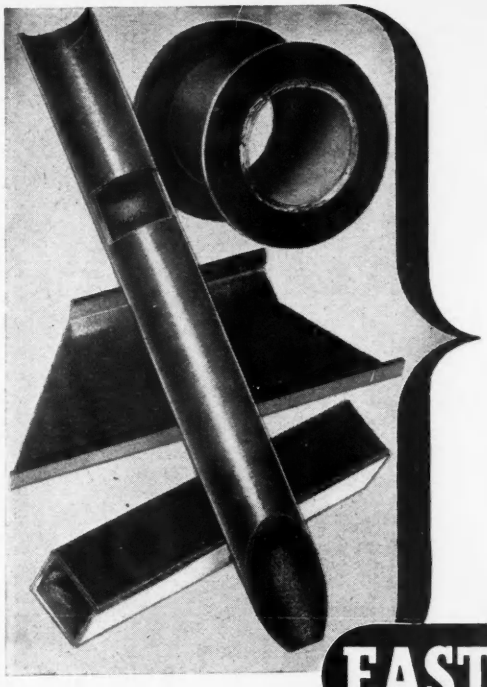

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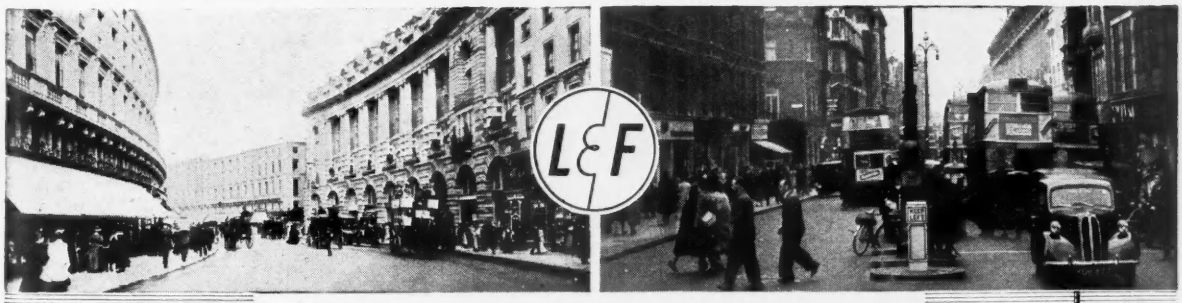

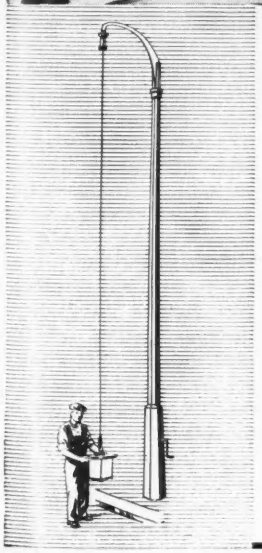

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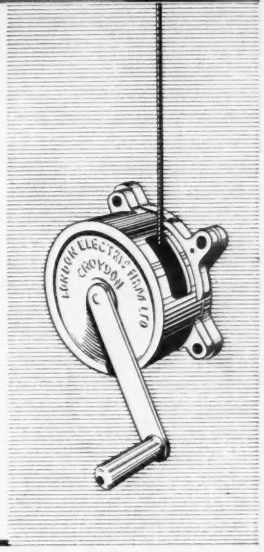

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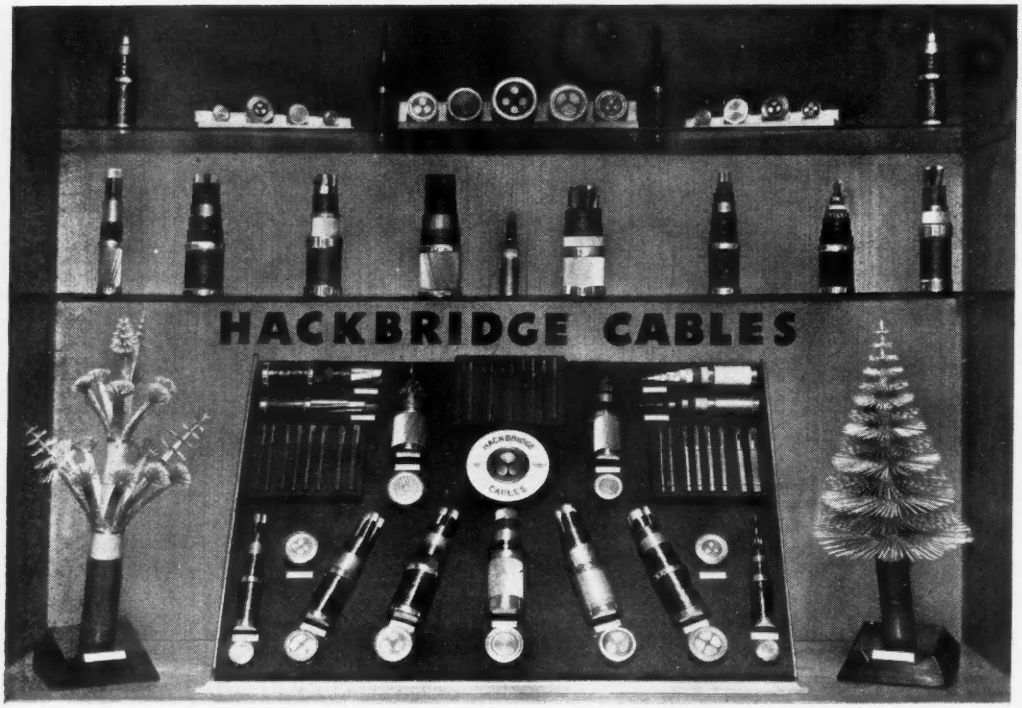

HACKBRIDGE *Cable Company Limited*
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In Association with BRYCE ELECTRIC CONSTRUCTION Co. Ltd.
Branches at BIRMINGHAM, BRISTOL, CARDIFF, MANCHESTER, NEWCASTLE, SHEFFIELD

This is UNISTRUT

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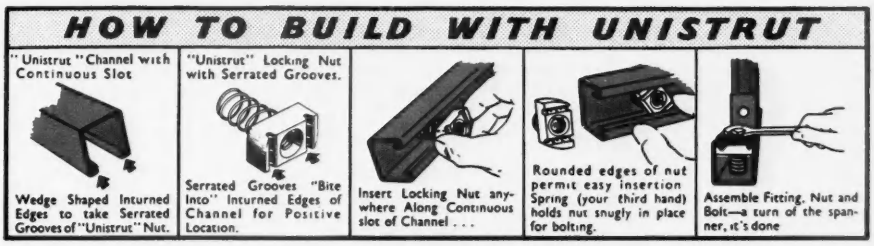
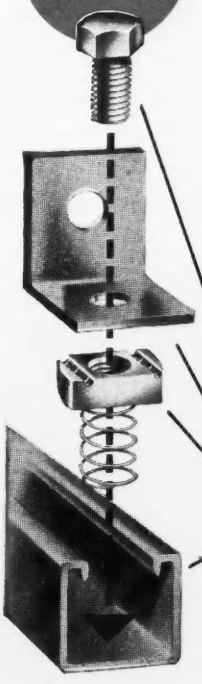
COMPLETELY ADJUSTABLE • NO DRILLING • NO WELDING • NO DETAIL DRAWINGS REQUIRED • "UNISTRUT" SAVES TIME, LABOUR AND MONEY

HOW TO BUILD WITH UNISTRUT


"Unistrut" Channel with Continuous Slot
Wedge Shaped Inturned Edges to take Serrated Grooves of "Unistrut" Nut.
"Unistrut" Locking Nut with Serrated Grooves.
Serrated Grooves "Bite Into" Inturned Edges of Channel for Positive Location.
Insert Locking Nut anywhere Along Continuous slot of Channel . . .
Rounded edges of nut permit easy insertion Spring (your third hand) holds nut snugly in place for bolting.
Assemble Fitting, Nut and Bolt—a turn of the spanner, it's done

THE BASIC COMPONENTS



THE BASIC COMPONENTS

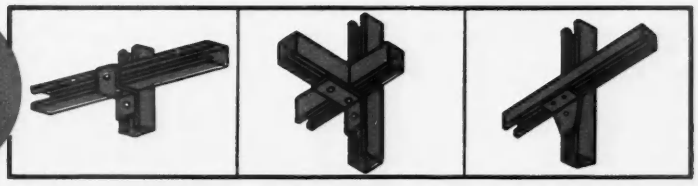
Unistrut Bolt
½" and ¼" sizes.

Unistrut Framing Fittings

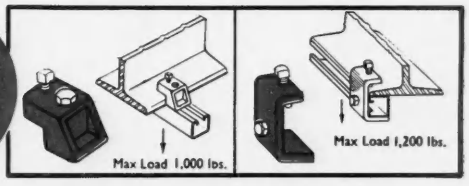
Unistrut Locking Nut.

Unistrut Channel 12 gauge 10'-0" and 20'-0" standard lengths.
Standard finish - Bonderized and stove enamelled olive green. Also available galvanized or plain, oil protected.

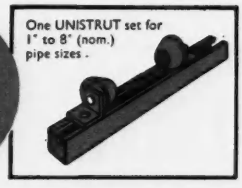
FRAMING FITTINGS



BEAM CLAMPS

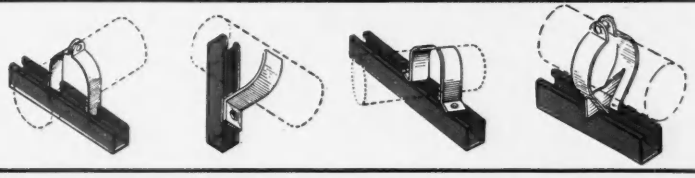


ROLLER PIPE SUPPORTS

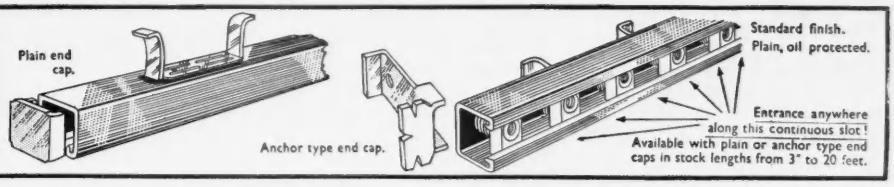


CABLE PIPE AND CONDUIT CLAMPS

There is a UNISTRUT Clamp for ½" to 8" (O.D. or nominal).



CONCRETE INSERTS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Anchor type end cap.
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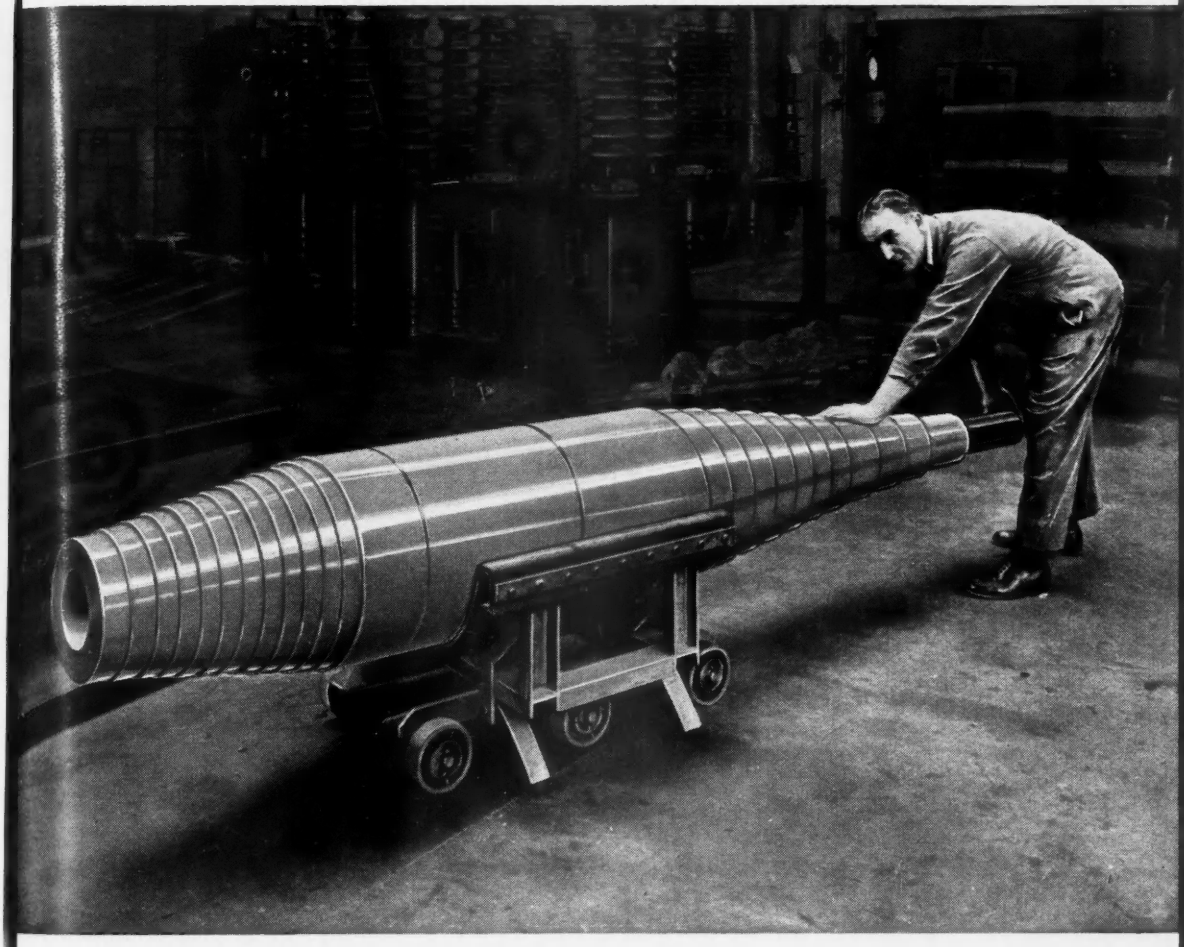

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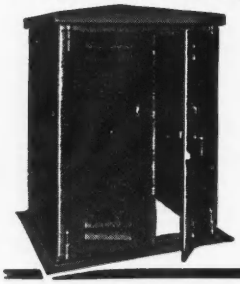

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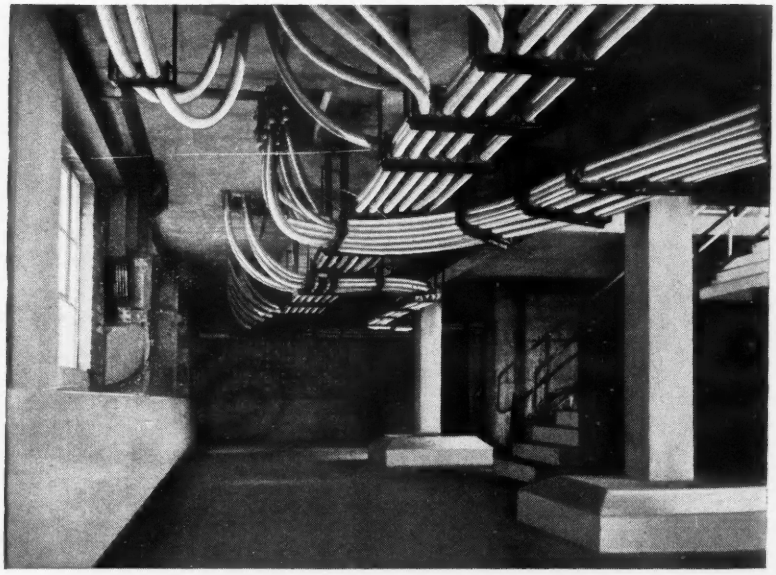

To facilitate increased production of beet sugar at the Kidderminster and Poppleton factories of the British Sugar Corporation Ltd., a complete re-planning of the L.T. power and lighting distribution schemes was recently undertaken. This work, involving the erection and jointing of some 4,000 yards of Ediswan paper-insulated mains cable in each factory, was designed and carried out by the Cable Contracts Department of The Edison Swan Electric Co. Ltd., in association with the Corporation's engineers.

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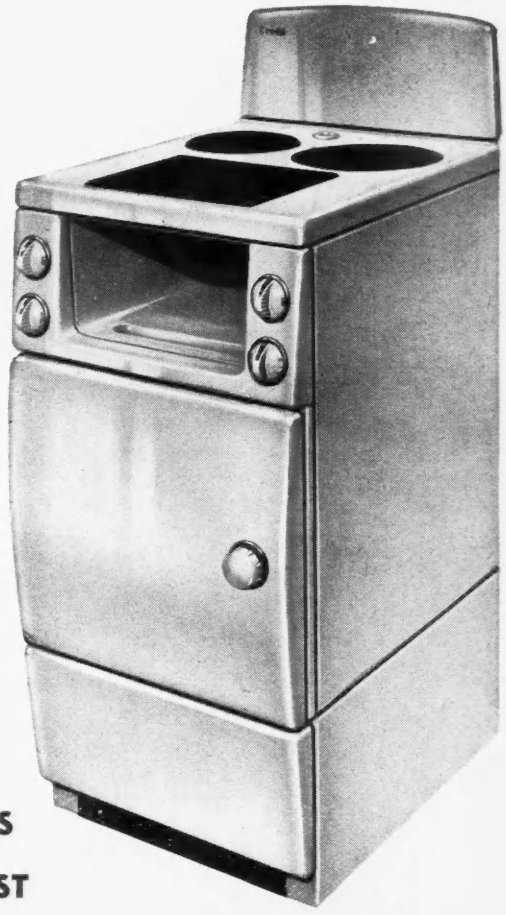

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Uses increasing for New-type Mesh Metal

ADAPTABLE & ECONOMICAL

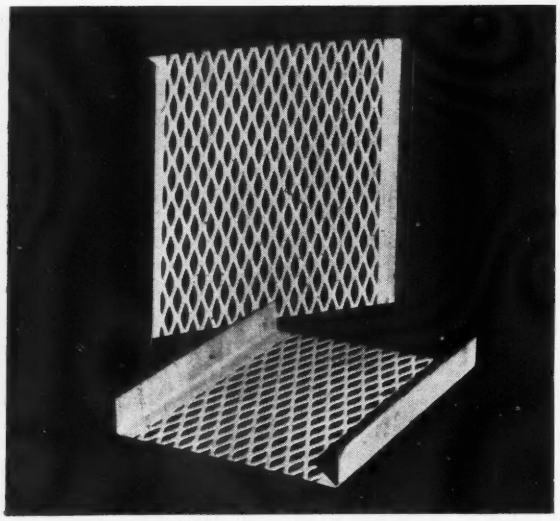
NEW uses for expanded metal are being discovered daily. The following are only a few of its many applications:— Safety guards for all kinds of machinery, radiators, trees, windows, ventilators, fires, etc. Racks and shelves, industrial trays and baskets, storage bins; air filters; backing for insulating materials; poultry cages; pallets and stillages; balcony balustrading; litter baskets; partitions and enclosures. Indeed, hundreds of widely different types of articles are now better and more easily made with Expanded Metal, now available in two new forms: Flattened "Expamet" and Safe-mesh "Expamet".

What is Expanded Metal?

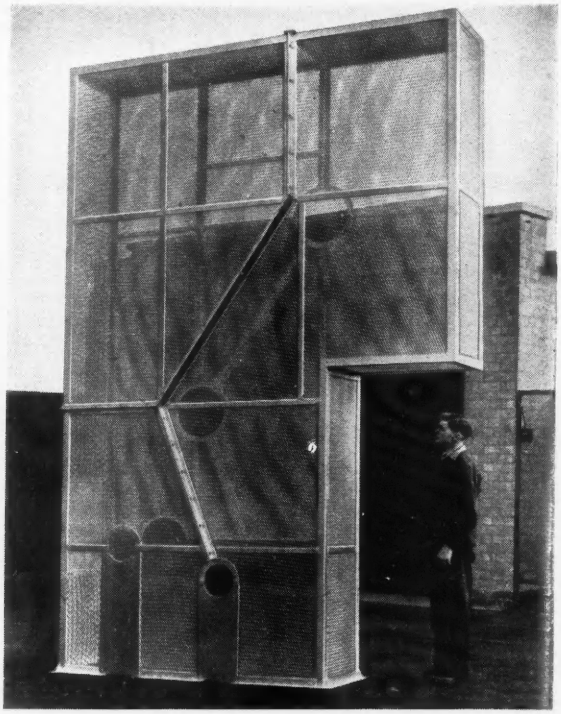
Expanded metal is made from a solid sheet of rolled sheet metal—steel, stainless steel, aluminium, brass or copper. It is cut and expanded without any waste of material into a network of diamond shaped meshes. The finished meshwork is strong and durable; it is easy to work, weld and shape; it has a naturally decorative appearance and is suitable for most of the available finishing processes.

Two New Types

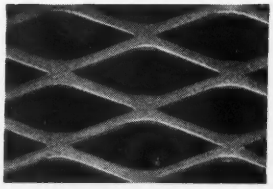
The two new basic ranges of expanded metal which are now on the market are — Flattened and Safe-mesh "Expamet". The first, Flattened "Expamet", is made by brushing and pressure-rolling the strands and junctions of Expanded Metal, so as to obtain a flat, smooth and level surface. The other, Safe-mesh "Expamet", is a range of meshes which have been brushed to remove all burrs and rough edges.



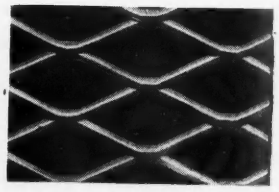
Cable trays *made from Flattened "Expamet".*



Machinery Guards *Machinery guards are one of the many uses for Safe-mesh "Expamet". The above were made by the City Sheet Metal Works, Ltd., Leicester.*



Flattened "Expamet" *The above illustration shows an example of Flattened "Expamet". This is made in thirteen different weights and mesh sizes from 5/32" to 1¼" (shortway of mesh).*



Safe-Mesh "Expamet" *Pictured above is Safe-Mesh "Expamet" which is produced in eight standard weights, and in mesh sizes from ½" to 1½" (shortway of mesh).*

Can it Help You?

Adaptable, economical and long lasting — there are an infinite number of uses for Expanded Metal. Wherever there is a gap to be filled or an article to be made with open meshwork, industry is using this very versatile material; and imaginative executives are finding new and unsuspected uses for it daily. For full information and advice, please write or telephone.

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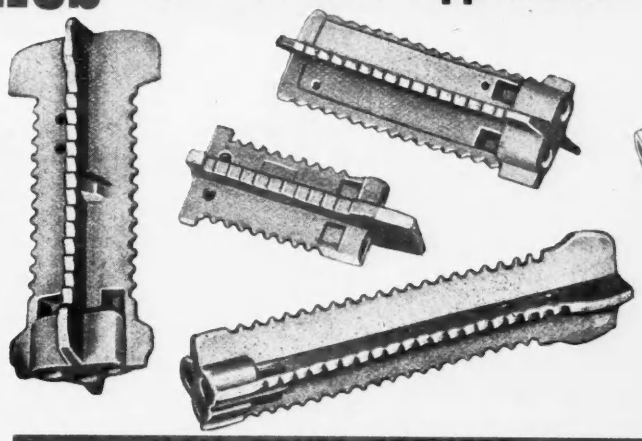
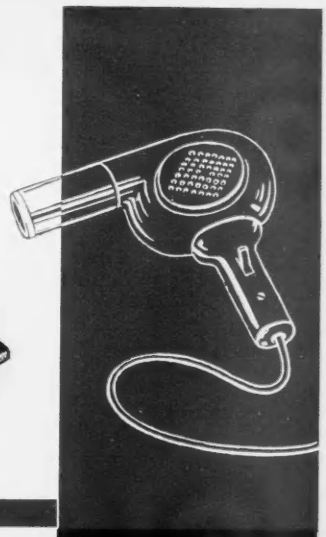


HAIR DRYER FORMERS



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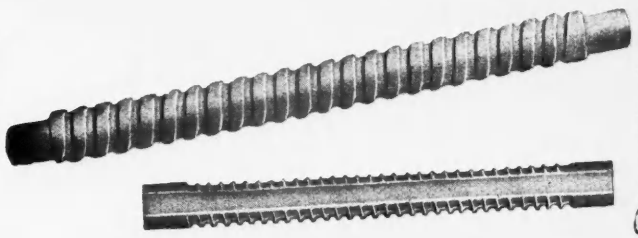
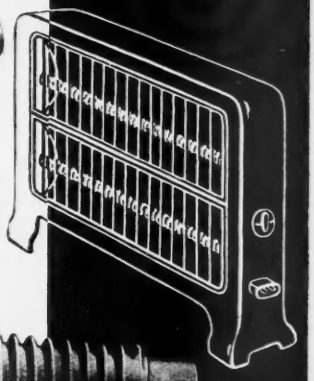
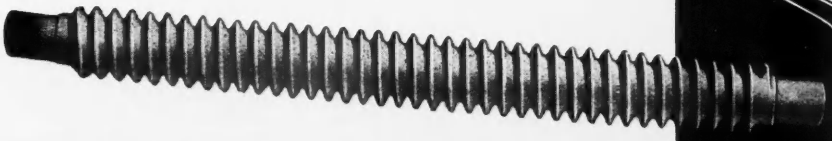




We solicit your enquiries and problems



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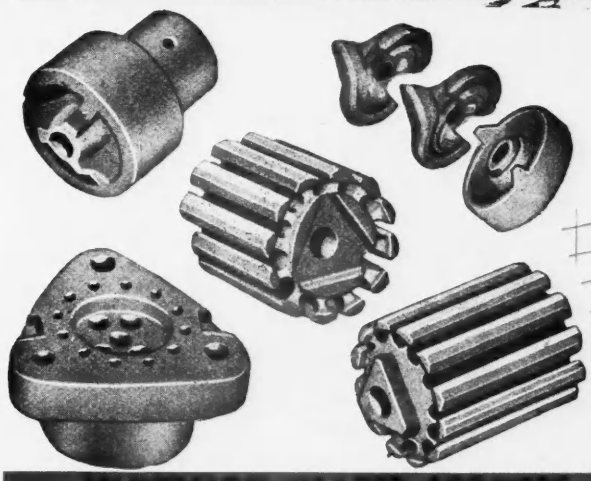

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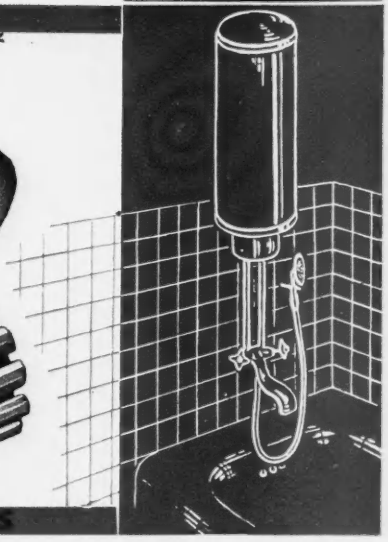

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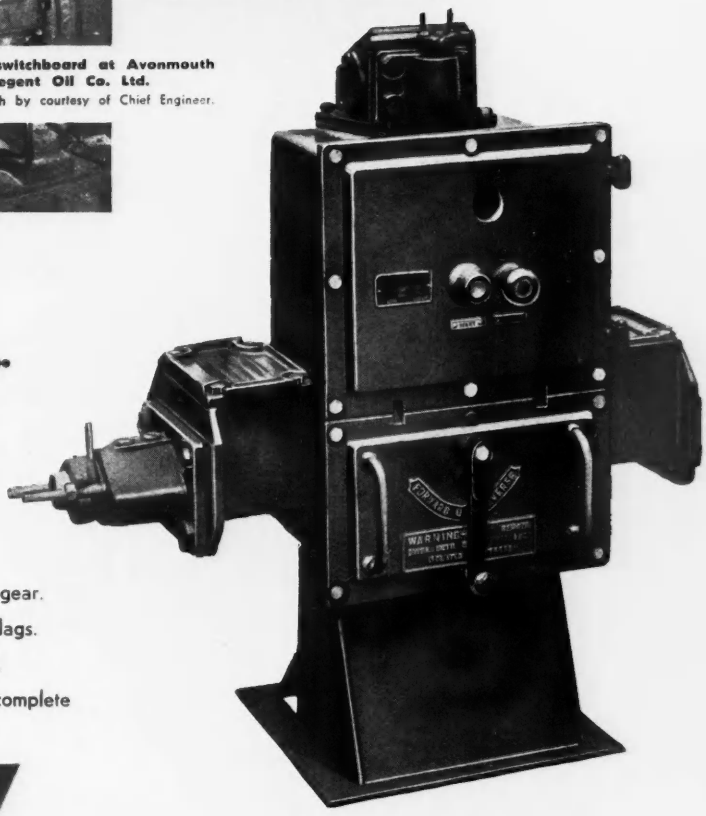
6-Unit double tier switchboard at Avonmouth depot of Regent Oil Co. Ltd.
—photograph by courtesy of Chief Engineer.



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flameproof contactor starter

30 amp (up to 650 volts A.C.).
Certified for Groups I & II Gases.
Single or Double Tier formation.

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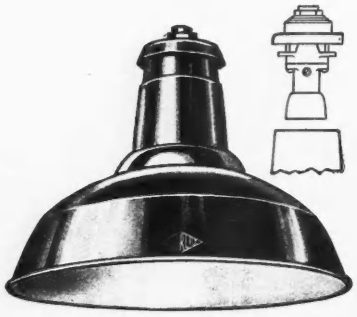
DISPERSIVE 20° CUT OFF DETACHABLE TOP



No.	Watts	Diam.	Price
TS 310	40 BC	10″	23/8
TS 315	60 BC	12″	27/4
TS 320	100 BC	14″	32/4
TS 325	150 BC	14″	33/4
TS 330	150 ES	14″	36/-
TS 335	200 ES	16″	40/-
TS 340E	300 G	18″	65/4
TS 345	500 G	18″	65/4
TS 347	750/1000 G	20″	79/8
	DISCHARGE MV		
TS 326	80 3-Pin	14″	36/-
TS 331	125 3-Pin	16″	40/-

DISPERSIVE 20° CUT OFF WITH WIRING BOX AND DETACHABLE REFLECTOR

No.	Watts	Diam.	Price
TS 954	40 BC	10″	31/8
TS 955	60 BC	12″	35/4
TS 956	100 BC	14″	40/4
TS 957	150 BC	14″	41/4
TS 958	150 ES	14″	44/-
TS 959	200 ES	16″	48/-
TS 960	300 G	18″	77/4
TS 961	500 G	18″	77/4
TS 962	750/1000 G	20″	91/8
	DISCHARGE MV		
TS 963	80 3-Pin	14″	44/-
TS 964	125 3-Pin	16″	48/-

DISPERSIVE 20° CUT OFF WITH WIRING BOX, REFLECTOR DETACHABLE OVER THE LAMP

No.	Watts	Diam.	Price
TS 904	100 BC	14″	46/4
TS 906	150 BC	14″	46/4
TS 908	150 ES	14″	48/8
TS 910	200 ES	16″	53/8
TS 912	300 G	18″	81/8
TS 914	500 G	18″	81/8
TS 916	750/1000 G	20″	96/-
	DISCHARGE MV		
TS 918	80 3-Pin	14″	48/8
TS 920	125 3-Pin	16″	53/8

VENTILUX TOP. OVERLAMP. REMAINS CLEAN LONGER

No.	Watts	Diam.	Price
TG 1802	200 ES	16″	59/-
TG 1804	300 G	18″	90/-
TG 1806	500 G	18″	90/-
TG 1808	750/1000 G	20″	107/8
	DISCHARGE MV		
TG 1810	80 3-Pin	16″	59/-
TG 1812	125 3-Pin	16″	59/-
TD 1814	250	14″	88/8
TD 1822	400 MV—MVF	18″	99/-

DISPERSIVE MV FLUORESCENT TYPE WITH WIRING BOX AND DETACHABLE OVERLAMP REFLECTOR

No.	Watts	Diam.	Price
TF 300	80 3-Pin MVF	16″	53/8
TF 301	125 3-Pin MVF	16″	53/8
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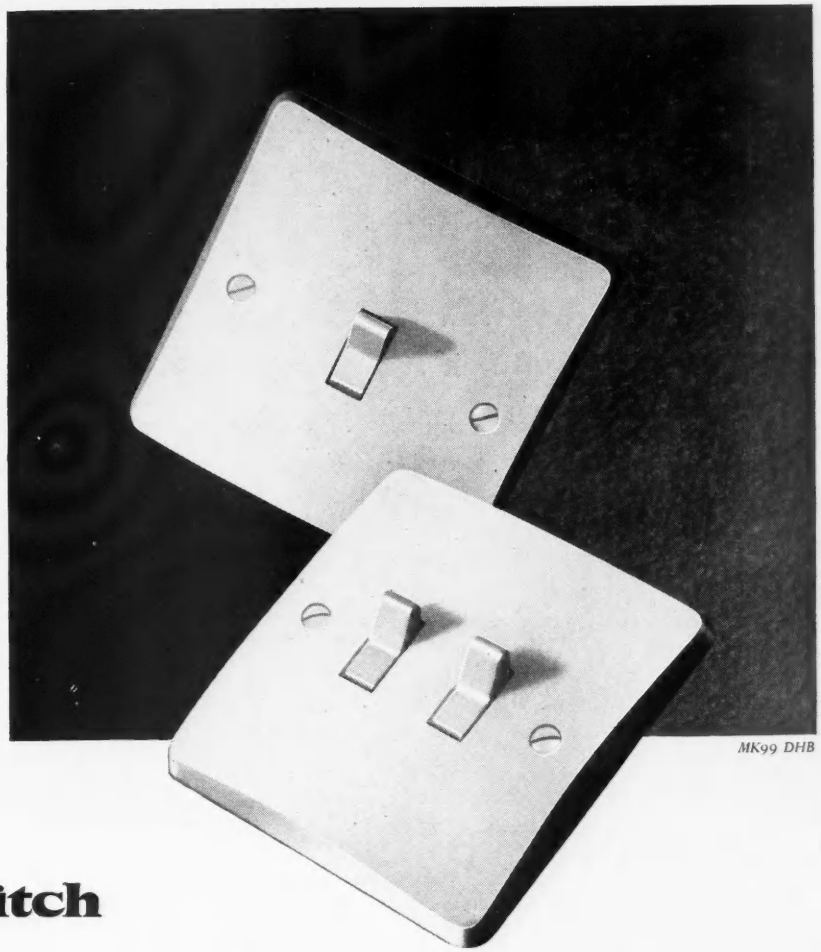

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Every detail of the distinctive new **Plateswitch** is worth studying. The quality of the materials and the finish bear the closest possible inspection. Installation is made easier by provision for automatic levelling with the plaster and generous and well-positioned terminals. Both one and two gang patterns have BS 1299 fixing centres. The action is positive, yet the **Plateswitch** is easily operated in silence. In its clean modern lines, too, the **Plateswitch** is right up to the minute.

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Ask for leaflet 227 and compare the value.

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page 600

New & Secondhand PLANT & MACHINERY for prompt delivery from the LARGEST STOCKS in the country

STEAM DRIVEN GENERATING PLANT

780-kW. MET-VICK pass-out/condensing Turbo Generator Set, 150/250 lbs. pressure, pass-out 15/30 lbs. pressure; suitable for full, or part condensing; Generator 220 volts D.C.

500-kW. MET-VICK pass-out/condensing Geared Turbo Alternator Set, 150/250 lbs. pressure, pass-out 15/30 lbs. pressure. Alternator 400/3/50.

350-kW. W. H. ALLEN/L.D.M. Geared Turbo Set, 180 lbs. pressure, 575° F. pass-out 13,000 ibs. per hour, 25/30 lbs. pressure, balance exhausting to condenser. Alternator 400/440/3/50, 4-wire.

250-kVA. BELLISS & MORCOM/HARLAND. Engine vertical compound 140/160 lbs. pressure, 15 lbs. back pressure, 428 r.p.m.; running without cylinder lubrication. Alternator 400/3/50.

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187-kVA. BROWETT LINDLEY/BRUCE PEEBLES. Engine vert., compound, 140 lbs. pressure, 5 lbs. back pressure, 428 r.p.m. Alternator 400/3/50, 4-wire.

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All Complete with Accessories and Switchgear

3 PHASE TRANSFORMERS

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750	Bryce	11000	430	Indoor
500	E.C.C.	6600	415	Outdoor
500	Brush	3300	440	Indoor
400	Hackbridge	3300	400	Indoor
300	E.C.C.	6600	415	Indoor
200	B.E.T.	15000	400	Outdoor
200	Hackbridge	30000	400	Outdoor
125	Hackbridge	6600	400	Indoor
110	G.E.C.	11000	400	Indoor
100	B.E.T.	22000	220	Outdoor
100	Met. Vickers	5500	400	Outdoor

UNUSED SQUIRREL CAGE MOTORS
400/440/3/50

H.P.	*Make*	*Speed*	*Type*
7½	Brook	1,440	S. Prot.
6	Brook	1,440	S. Prot.
5	Brook	2,850	S. Prot.
5	Bull	1,450	Tot. Enc.
5	Brook	1,450	Tot. Enc.
4	Brook	2,910	S. Prot.: ½ hr. rated
4	Bull	960	Tot. Enc.
4	Brook	750	S. Prot.
3	Brook	2,880	S. Prot.: ½ hr. rated
2	Brook	2,860	S. Prot.: ½ hr. rated
2	Brook	1,420	Tot. Enc.: ½ hr. rated
2	Brook	930	Tot. Enc.: ½ hr. rated
1½	Bull	1,430	Tot. Enc.
1	Brook	2,850	Tot. Enc.: ½ hr. rated

Quantities of each size available.

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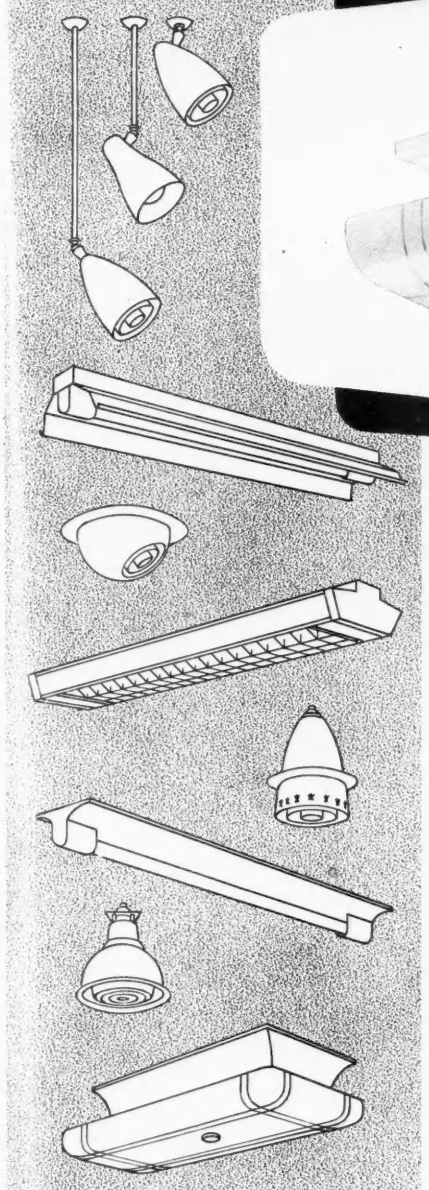

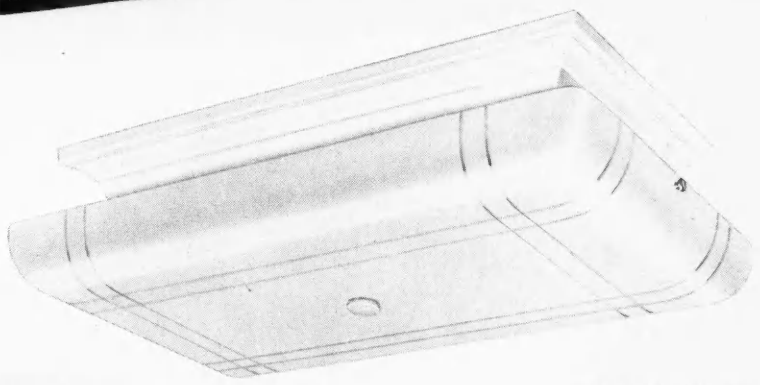

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The moulded one-piece diffuse perspex dish is quickly and easily detachable for cleaning and lamp replacement. Body assembly is of substantial construction, rustproofed and finished best quality stoved enamel. Complete with Handslite "Ever-start" control gear wired ready for connection to mains supply.

The fitting is suitable either for mounting direct on ceiling or for suspension by chain or tube.

The particular model illustrated above is for four 2ft. 40 watt lamps but other sizes are available.

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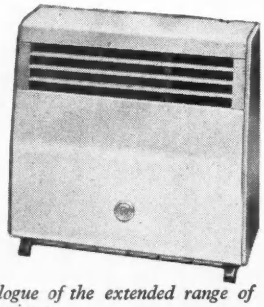

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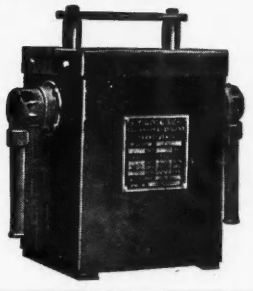

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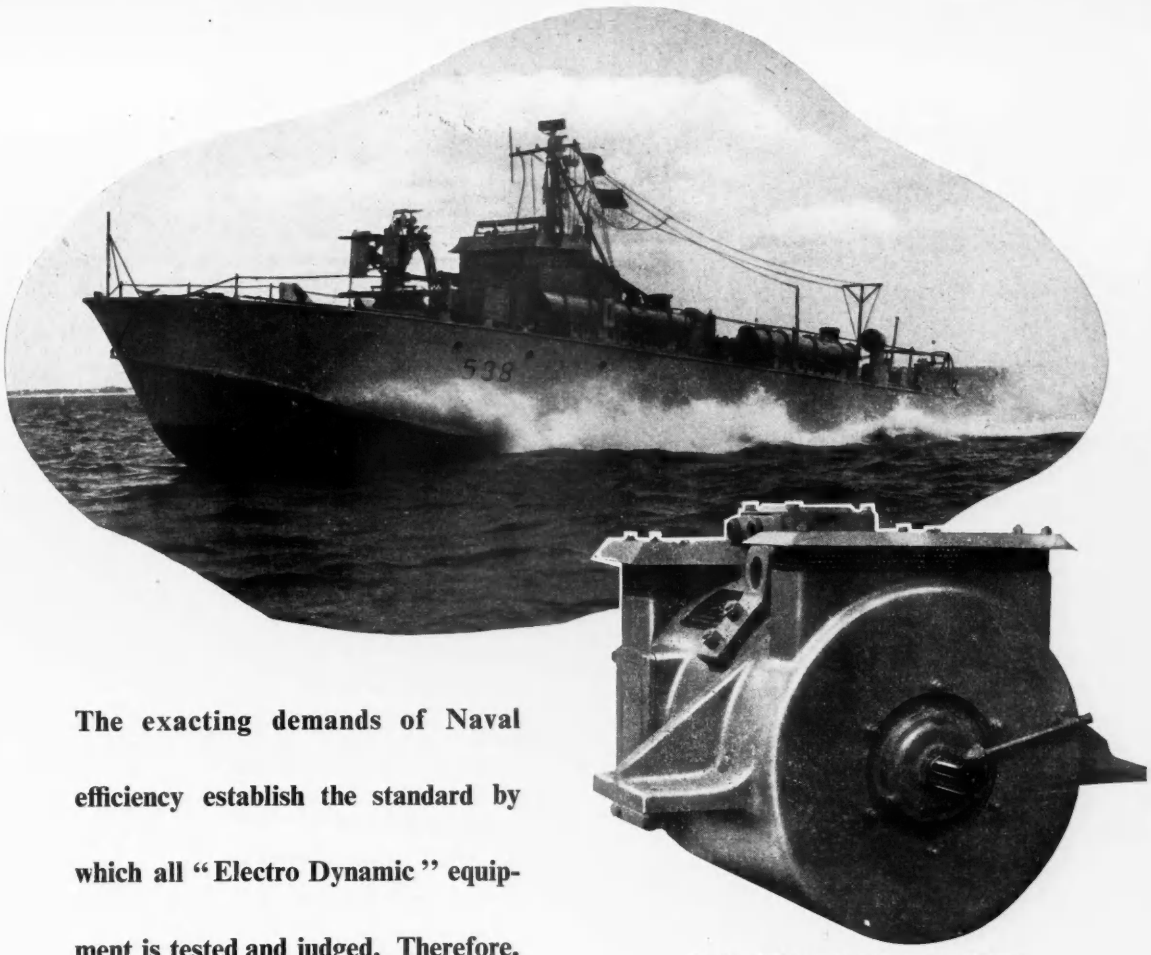

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Sensitivity: ± 0.1° F for small loads

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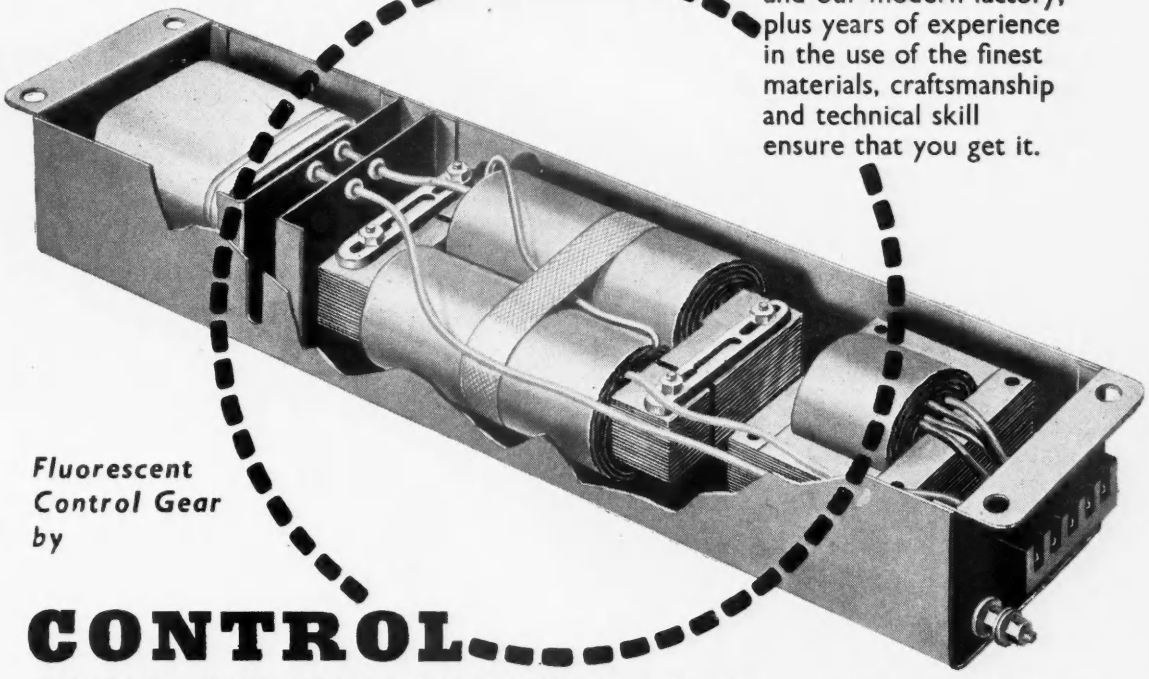

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'STATAIR' Units

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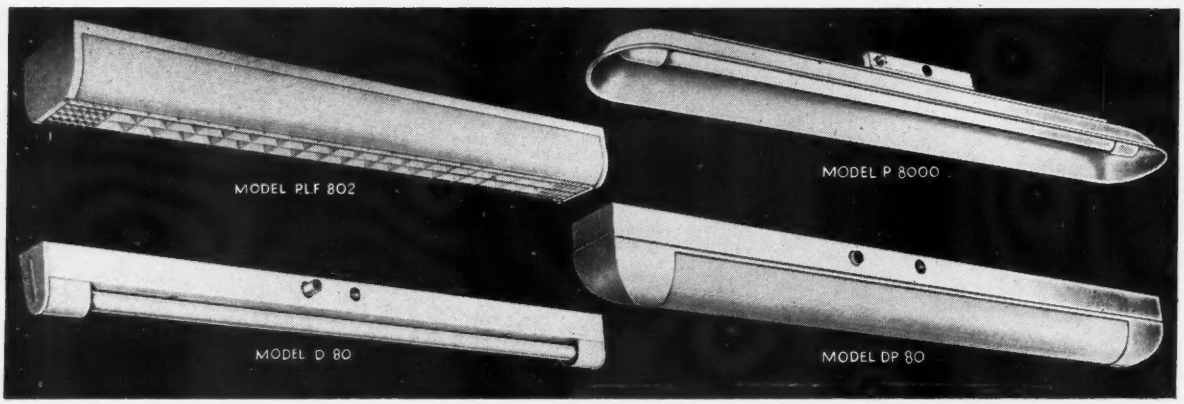

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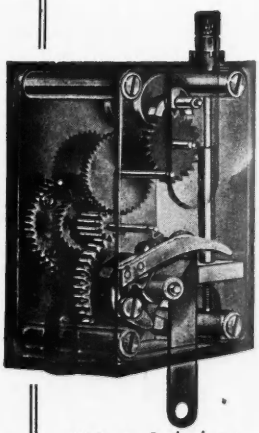

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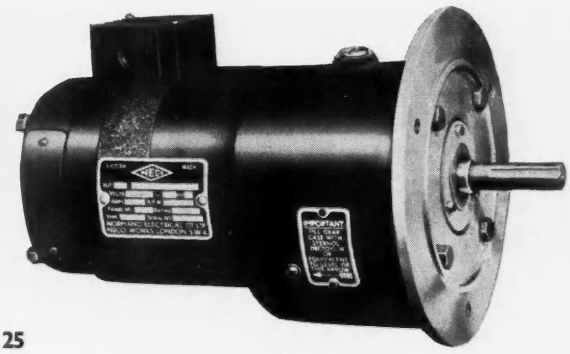

TYPE 25
in-line drive

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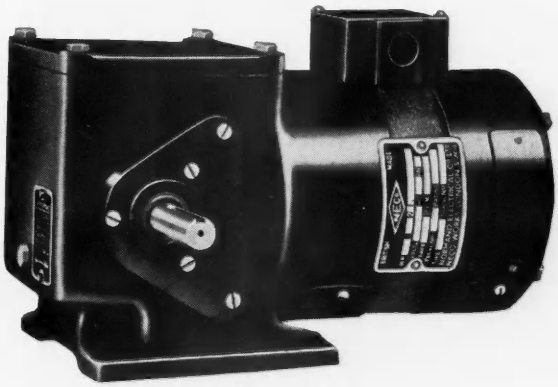
Type 25, in-line drive, and SW, right angle drive, have the same bolting plan and shaft height, and can be made to mount in any specified position, while Type 25 can also be flange mounted. $\frac{1}{8}$ H.P. motors, 3-phase s.c., 1-phase R.I., D.C., A.C. series, or Universal. Final speeds of Type 25 are between 312 and 0.079 r.p.m., and of SW 270 to 0.055 r.p.m., without a change of dimensions.

NECO geared motors with outputs up to 1500 lb.ft. NECO ungeared motors up to 5 H.P.



TYPE SW
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WITHIN RANGE OF 8½ TO 55 K.W.

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GENERATOR EFFICIENCY		80%	81%	83%	84%	85%
SPEED OF ENGINE	CURRENT					
1000 r.p.m.	50c A.C. or D.C.	8½ k.w.	12½ k.w.	18 k.w.	20 k.w.	30 k.w.
1200 r.p.m.	60c A.C. or D.C.	10 k.w.	15 k.w.	22 k.w.	24 k.w.	37½ k.w.
1500 r.p.m.	55c A.C. or D.C.	13 k.w.	18½ k.w.	27 k.w.	30 k.w.	45 k.w.
1800 r.p.m.	60c A.C. or D.C.	15½ k.w.	21½ k.w.	30 k.w.	35 k.w.	55 k.w.

K.W. outputs are for 12-hour continuous operation at altitudes not exceeding 500 feet and ambient temperature of 85° F. For 24-hour continuous operation they should be reduced by 10%, also by 2% for every 10° F. by which the ambient temperature exceeds 85° F., and by a further 4% for every 1,000 feet above 500 feet. When generator efficiency varies from above, capacity should be adjusted to suit. Specification details of engine sent on request.

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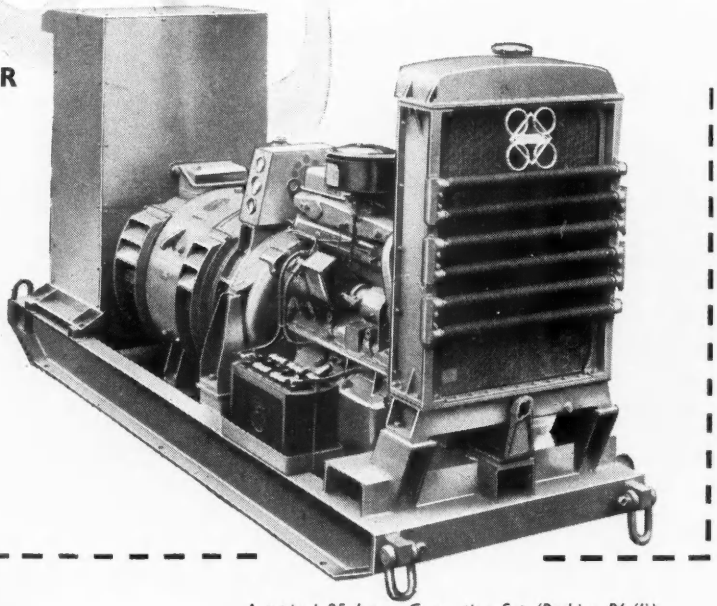

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Perkins HIGH QUALITY

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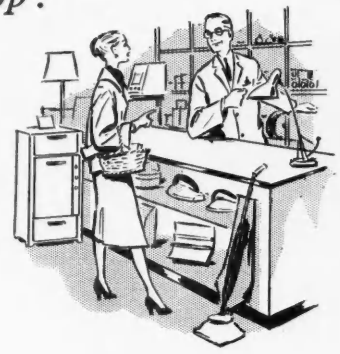

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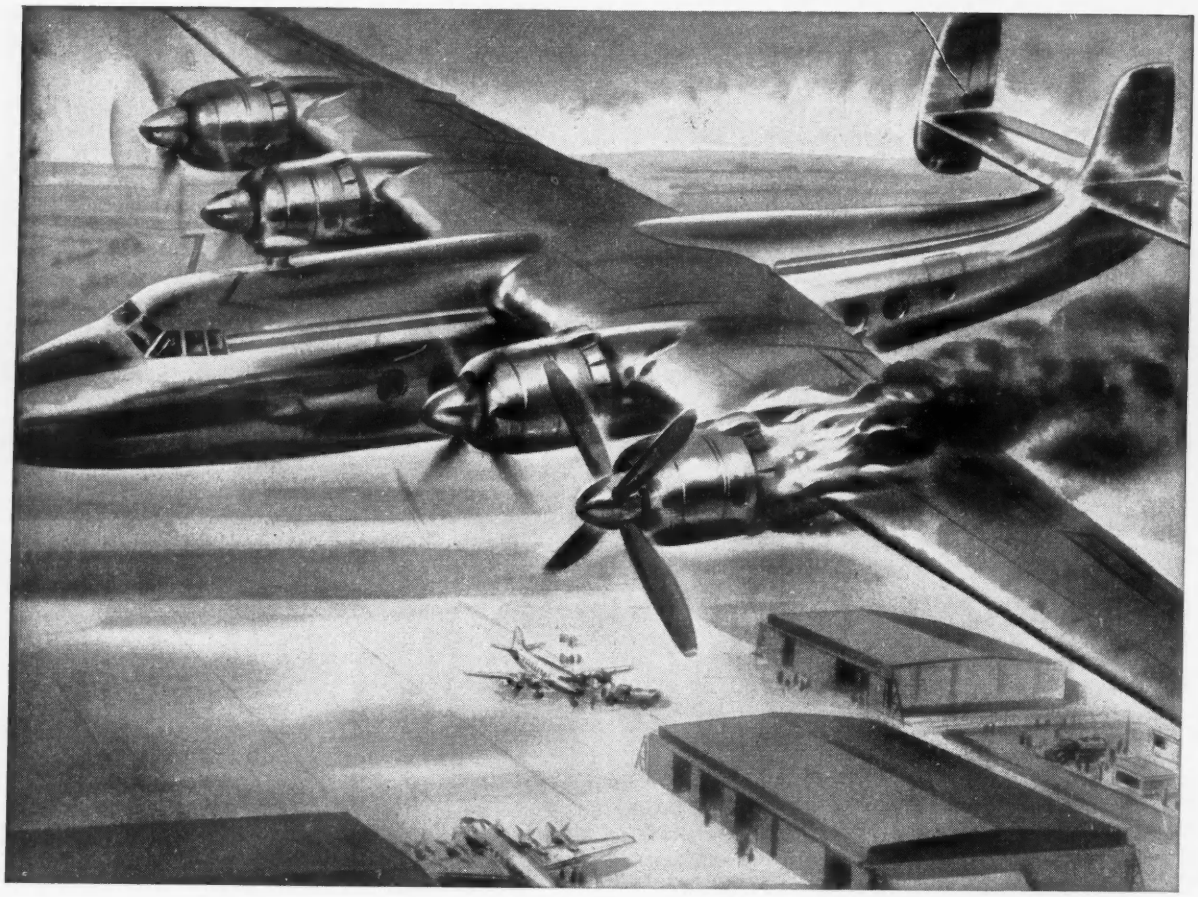


Once this would have meant almost certain disaster . . .

Today it probably means no more than an extra job for the ground staff—for modern multi-engined aircraft will fly with one or more engines shut-down . . . provided the controls to the remaining engines are intact. This is one reason why most aircraft use 'Fibreglass' insulated Pren* cables which stand up to direct exposure to flame. Other reasons — which apply to all 'Fibreglass' electrical insulation — are less weight, less space, greater heat resistance, higher safe working-temperatures, freedom from alkali with consequent resistance to moisture. All of which mean longer life and greater reliability.

**'Pren' cables incorporate one or more layers of braided glass fibre and are finished with a fire-retarding lacquer.*

wrap it in* FIBREGLASS *for safety

TRADE MARK

DURABLE · FIRE-SAFE · ECONOMICAL · AND AVAILABLE NOW

FIBREGLASS LTD., RAVENHEAD, ST. HELENS, LANCS. (ST. HELENS 4224)

London Office: 63/65 Piccadilly, W.1 *(Hyde Park 2115)* · **Glasgow Office:** 136 Renfield Street *(Douglas 2687)* · **Manchester Office:** 11 Piccadilly *(Blackfriars 8863)* · **Newcastle Office:** 16 Dean Street *(Newcastle 20938)* · **Birmingham Office:** Piccadilly Arcade, 105 New Street *(Midland 0464)* · **Dublin Office :** 21 Merrion Square North *(Dublin 67060)*

The DS
FUSED PLUG
TO B.S.S. 1363
With the Patent
HINGED PIN
Which enables fuses to be changed without tools!
★ Patent No. 638780

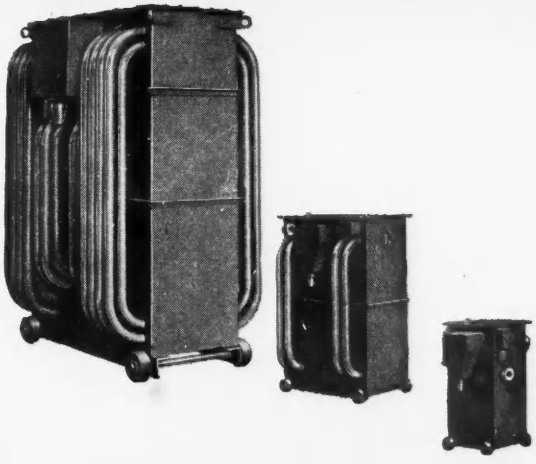
Full details from . .

D. S. PLUGS LTD.

MANCHESTER · 5

TRANSFORMERS

AUSWAL PRODUCTS
REG. TRADE MARK



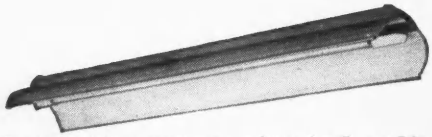
WE MANUFACTURE
TRANSFORMERS
UP TO
500 KVA
FOR INDUSTRIAL AND DISTRIBUTIONAL APPLICATIONS

- PORTABLE TRANSFORMERS
- CURRENT AND POTENTIAL TRANSFORMERS
- RECTIFIER UNITS TO CUSTOMER'S SPECIFICATION

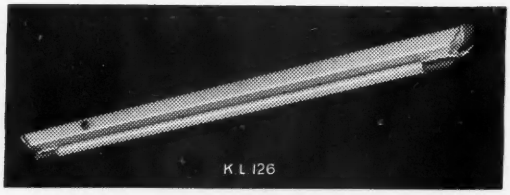
AUSTIN WALTERS & SON, LTD
TRANSFORMER DEPT.
AYRES ROAD, OLD TRAFFORD
MANCHESTER · 16.

Phone: TRAFFORD 1827/8 Grams: "OHMIC, MANCHESTER 16"

Smithlite makes Light of Everything

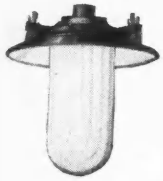


The K.L.135 Fluorescent open end trough reflector 5 ft. 80 watt H.P.F. single lamp, rust proofed and stove enamelled. All control gear totally enclosed.



FLUORESCENT FITTINGS

K.L.126 ceiling batten reflector. 5 ft. 80 watt H.P.F. single lamp, lead coloured sheet steel, giving lasting non-rust life. Stove enamelled in white. All control gear totally enclosed.



TUNGSTEN FITTINGS

These illustrations show just a few of our Tungsten range and like all our products are unsurpassed for quality, value and finish.

Catalogues are available on request giving details of our complete ranges.

WASH BOILERS

This Smithlite Wash Boiler has 50 years' manufacturing experience behind it and is designed to give years of satisfactory service under the most exacting conditions. Entire unit is fully guaranteed. Tinned copper container with 10 gal. capacity. Aluminium lid with recessed heat resisting handle, loading 3 k.w., 3 heat and off, double pole switch, chrome tap of neat design. Height 26", diameter 17¾". Height of tap 12¾".

Herman Smith Smithlite Ltd., are proud to announce that the Fluorescent lighting fittings for the new Engineering Centre, Stevenson Place, Birmingham, were designed and manufactured by them.

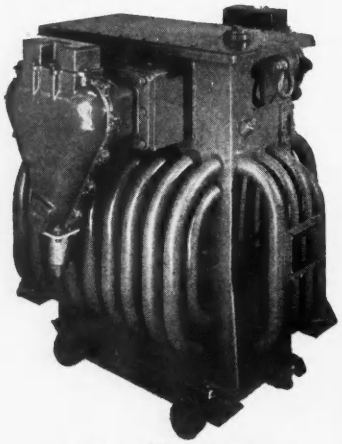
HERMAN SMITH SMITHLITE LTD
EMPIRE WORKS · DUDLEY · WORC'S.
TEL: DUDLEY 3178 · GRAMS. 'SMITHLITE' DUDLEY

STL

TRANSFORMERS
for Distribution and Industry

- ★ RECTIFICATION
- ★ PHASE CONVERSION
- ★ LOW VOLTAGE SUPPLIES
- ★ FURNACES
- ★ ARC WELDING
- ★ ELECTRONIC EQUIPMENT

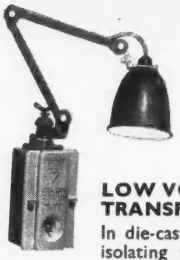
Ratings up to 250 kVA



50 kVA, 11,000/400 V, 3 phase Substation Transformer

S.T.L. *Transformers are widely used in industry where reliable units are required for continuous duty*

STEWART TRANSFORMERS LTD.
Kilburn Lane London W.10 Tel. LADbroke 2296/7



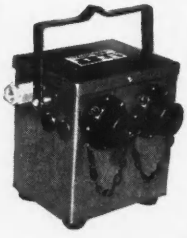
Electrical
EQUIPMENT

LOW VOLTAGE LIGHTING TRANSFORMER

In die-cast Aluminium Case, Self-isolating fitted with D.P. on-off Switch and H.R.C. Fuses to B.S.S. 794/38. Can be supplied with 1, 2 or 3 arm Lighting Brackets or Low Voltage Plugs and Sockets.

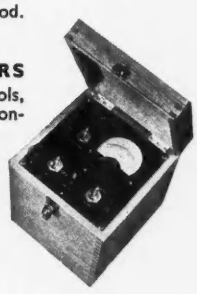
MEDIUM VOLTAGE ALL INSULATED TEST LAMP

100 — 500 Volts. A.C. D.C. Fitted with H.R.C. Fuses in each prod.



PORTABLE TRANSFORMERS

For portable m/c tools, handlamps, etc., Secondary Voltages from 12 V — 110 Volts. Capacities from 50 V.A. to 750 V.A.



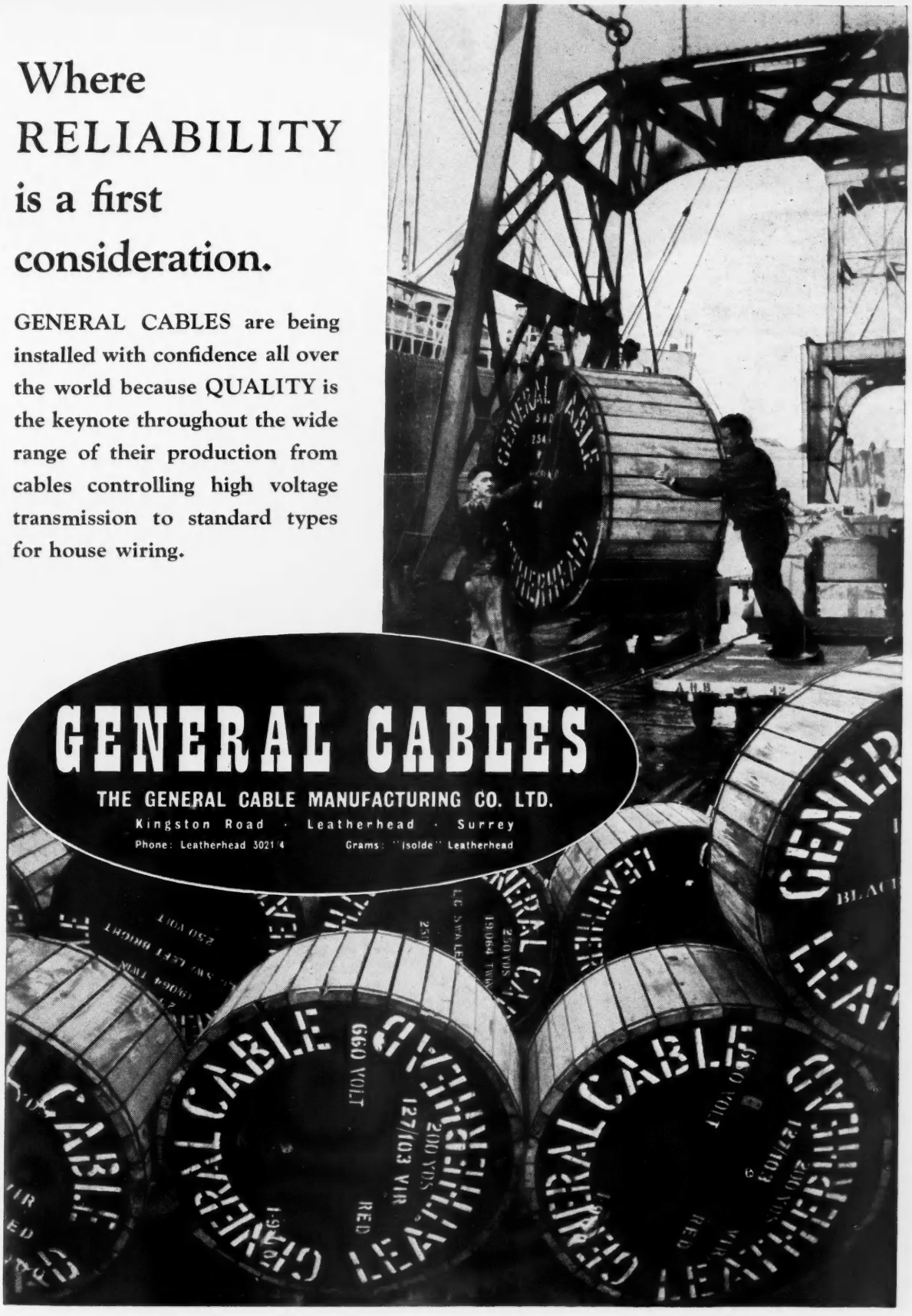
LOOPMETERS

For testing earth fault loop resistance —2 models available.

JOHN DRUMMOND (ENGINEERS) LTD.
23 LOCHBURN ROAD · MARYHILL · GLASGOW N.W.
Telephone: Maryhill 1893

Where RELIABILITY is a first consideration.

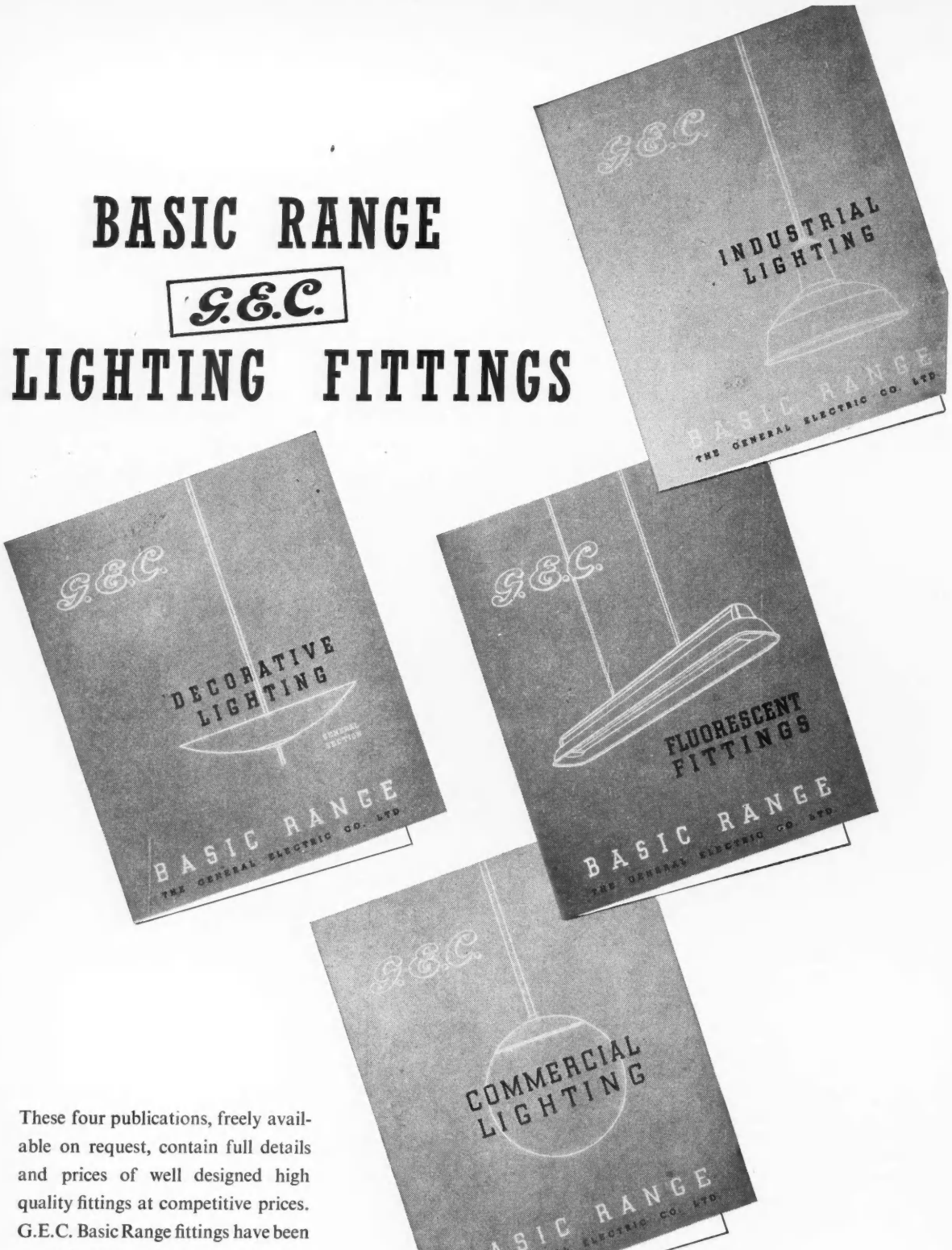
GENERAL CABLES are being installed with confidence all over the world because QUALITY is the keynote throughout the wide range of their production from cables controlling high voltage transmission to standard types for house wiring.



BASIC RANGE

G.E.C.

LIGHTING FITTINGS



These four publications, freely available on request, contain full details and prices of well designed high quality fittings at competitive prices. G.E.C. Basic Range fittings have been specially chosen to meet the majority of your lighting requirements.

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

CLASSIFIED ADVERTISEMENTS

ADVERTISEMENTS are accepted up to **First Post on Monday** of the week of issue, and should be addressed to Classified Advertisement Department, Dorset House, Stamford Street, London, S.E.1.

CLASSIFIED advertisements are PREPAID at 3/- per line (approx. 6 words) per insertion. Where an advertisement includes a **Box Number** this counts as two words and carries an additional charge of 1/-.

DISPLAYED:—£2 per inch, per insertion. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

URBAN DISTRICT OF ELLESMERE PORT

Contract No. 164

Conversion of Street Lamps from Gas to Electricity

THE Council invite tenders for Equipment, Materials and Labour required in the conversion of 165 Street Lamps from Gas to Electricity.

The drawings may be seen by appointment, and a set of tender documents, comprising the Institution of Electrical Engineers recommended conditions of contract, specification, bills of quantities and form of tender, may be obtained at the offices of the Council's Engineer and Surveyor, Queen Street, Ellesmere Port, on payment of a deposit of two guineas, which deposit will be refunded on the return of the contract documents, or, in the case of a bona fide tender which is accepted and not subsequently withdrawn, on completion of the formal contract between the Council and the successful tenderer.

Sealed tenders in the plain official envelope provided, together with contract documents, must reach the undersigned by not later than 5 p.m. on Tuesday, 31st August, 1954. Tenders received after this date and time will not be considered by the Council.

The Council do not bind themselves to accept the lowest or any tender.

P. J. HODGES,
Clerk of the Council.

Council Offices,
Ellesmere Port, Cheshire.
3rd August, 1954. 4488

ROTHWELL (YORKS) URBAN DISTRICT COUNCIL

Proposed Street Lighting, Coal Industry Housing Site, Oulton, Nr. Leeds

TENDERS are invited for the provision and erection of 32 Tungsten Gas Filled Filament Street Lighting Units with Prestressed Concrete Columns on the Coal Industry Housing Site, Oulton, Nr. Leeds.

Plans may be seen, and conditions of contract, specification and bill of quantities obtained, upon application to the Engineer and Surveyor on deposit of two guineas, which will be returned on receipt of a bona fide tender not subsequently withdrawn.

Tenders to be enclosed in plain sealed envelopes endorsed "Street Lighting, Coal Industry Housing Site, Oulton," and returned not later than 9 a.m. on Saturday, the 4th September, 1954, to the undersigned.

The Council do not bind themselves to accept the lowest or any tender.

ALLEN T. S. ROBERTSON,
Clerk of the Council.

Civic Buildings,
Rothwell, Nr. Leeds.
13th August, 1954. 4644

CITY OF SALFORD

TENDERS are invited for the supply and delivery of 1 24-ft. 3-section Motor Tower Wagon mounted on a 30-cwt./2-ton chassis.

Applications for copies of conditions of contract and specifications to be made to the Street Lighting Superintendent, 9, Frederick Road, Salford, 6.

Completed tenders should be returned in plain sealed envelopes endorsed "Tender for Motor Tower Wagon" and addressed to the Chairman, Street Lighting Committee, Town Hall, Salford, 3, not later than 12 noon on Saturday, the 4th September, 1954.

The Corporation does not bind itself to accept any or the lowest tender.

R. RIBBLESDALE THORNTON,
Town Clerk.
4552

BOROUGH OF KETTERING

Street Lighting: Trunk Road A.6

TENDERS are invited for (a) Supply, erection, wiring and fitting of 110 Steel Columns and electrical apparatus for 400-watt mercury vapour lamps; (b) Supply and erection of 110 Steel Columns and the wiring and fitting only of electrical apparatus of another supplier; (c) Supply only of electrical apparatus for 110 lighting units, all in connection with the improved lighting of two sections of Trunk Road A.6.

General conditions of contract and plans may be inspected and specifications, bills of quantities and forms of tender obtained from the Borough Engineer & Surveyor's Office, 3, Gold Street, Kettering, on payment of a deposit of £2 2s., which will be refunded on receipt of a bona fide tender and the return of all documents.

Tenders, in plain sealed envelopes endorsed "Lighting Scheme, Trunk Road," must be delivered to the undersigned not later than noon on Monday, 30th August, 1954.

The Council do not bind themselves to accept the lowest or any tender.

D. DUNSFORD PRICE,
Town Clerk.

Council Offices,
High Street, Kettering.
10th August, 1954. 4567

BOROUGH OF MITCHAM

Street Lighting Improvements, Stages IV, V & VI

Streatham Road (A.216), Carshalton Road (A.237), Commonside West and Croydon Road (A.236)

TENDERS are invited for the erection of 142 Single Arm Reinforced Concrete Columns with 140-watt Sodium Discharge Lamps and ancillary gear of approved pattern, complete with all wiring.

Form of tender, specification and schedule may be obtained from the Borough Engineer and Surveyor, Town Hall, Mitcham, at whose office the drawings and general conditions of contract may be inspected.

Tenders must be delivered to the undersigned in the envelope provided not later than 12 noon on Saturday, 4th September, 1954.

The Council do not bind themselves to accept the lowest or any tender.

R. H. WHITE,
Town Clerk.

Town Hall,
Mitcham, Surrey.
10th August, 1954. 4550

COUNTY OF LINCOLN—PARTS OF LINDSEY

North Lindsey Technical College, Scunthorpe

Second Instalment

THE County Council is prepared to receive tenders from selected firms for the installation of:—

(a) Heating, hot and cold water, and ventilation services,
(b) Electrical installation,

in the above building. Firms wishing to tender are requested to apply for the inclusion of their names on the Council's selected list, which will be limited.

Plans and specifications have been prepared by the County Council's Consulting Engineers, Messrs. J. Roger Preston & Partners, 15, North Audley Street, London, W.1.

Applications for inclusion in the list should be forwarded to the County Architect, County Offices, Lincoln, not later than 10th September, 1954. 4551

URBAN DISTRICT OF ELLESMERE PORT

Contract No. 167

Public Lighting Installation, Station Road and Rossmore Road (A.5032), Little Sutton

TENDERS are invited for the provision and erection of 19 Sodium Discharge Lamps.

The drawings may be seen by appointment, and a set of tender documents, comprising the Institution of Electrical Engineers recommended conditions of contract, specification, bills of quantities and form of tender, may be obtained at the offices of the Council's Engineer and Surveyor, Queen Street, Ellesmere Port, on payment of a deposit of two guineas, which deposit will be refunded on the return of the contract documents, or, in the case of a bona fide tender which is accepted and not subsequently withdrawn, on completion of the formal contract between the Council and the successful tenderer.

Sealed tenders in the plain official envelope provided, together with contract documents, must reach the undersigned by not later than 5 p.m. on Tuesday, 31st August, 1954. Tenders received after this date and time will not be considered by the Council.

The Council do not bind themselves to accept the lowest or any tender.

P. J. HODGES,
Clerk of the Council.

Council Offices,
Ellesmere Port, Cheshire.
3rd August, 1954. 4487

CITY OF BELFAST

Fire Extinguishing Equipments

TENDERS are invited for the supply, delivery and erection of carbon dioxide fire extinguishing equipments for electrical substations.

Form of tender and specification (No. W.45) may be obtained at the Electricity Department, East Bridge Street, Belfast, on payment of a deposit of two guineas which will be refunded provided a bona fide tender is lodged and not withdrawn. Extra copies may be obtained at one guinea each; this sum will not be returnable. Cheques should be made payable to the Belfast Corporation Electricity Department.

Each tender, in sealed envelope marked "Tender for Carbon Dioxide Fire Extinguishing Equipments, Electricity Committee," and endorsed with the name and address of the tenderer, must reach the undersigned not later than 4 p.m. on Friday, 10th September, 1954.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

City Hall, Belfast,
P.O. Box 234.
12th August, 1954. 4645

SITUATIONS VACANT

The engagement of person answering these advertisements must be made through the Local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order, 1952.

STEWART TRANSFORMERS LTD.

manufacturers of transformers up to 250 kVA have the following vacancies available:—

TRANSFORMER FITTER
(Wiring and tanking).
TRANSFORMER WINDER.
ASSISTANT TESTER.

Applicants having the necessary experience may apply in person or in writing to:—

75, Kilburn Lane,
Kensal Rise, London, W.10.

4655

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following vacancies:—

(a) SALES LECTURER; (b) INSTRUCTOR-LECTURER (110/54.N), HEADQUARTERS. These appointments are on the Headquarters staff, but the successful candidates will be located at the Board's Sales Training School at Hatfield, Herts.

Candidates for post (a) will be required to give instruction on the Board's sales policy and tariffs and should have had wide sales experience gained in a responsible position with a progressive sales organisation. A knowledge of sales technique, service centre display, window dressing, demonstrating, deportment and personnel relations is essential.

The salary will be in accordance with Grade 8 (£895 × £35 to £1,000) for a Principal Assistant under the National Joint Council Salary Agreement.

For post (b) candidates should have a knowledge of modern installation practice, domestic electrical appliances, space heating, refrigeration and domestic, commercial and industrial utilisation. Corporate membership of the Institution of Electrical Engineers will be an advantage.

The commencing salary will be £790 in accordance with Grade 5, Class AX/DX (£790-£858) for a Third Assistant Engineer under the National Joint Board Salary Agreement.

Apply to the Chief Commercial Officer, Eastern Electricity Board, Wherstead, Ipswich, Suffolk.

FIRST ASSISTANT DISTRICT ENGINEER, CHILTERNS SUB-AREA, LUTON DISTRICT (85/54.R). Candidates should have had a sound technical training and wide experience of the planning, construction, operation and maintenance of H.V. and L.V. underground and overhead systems, including substations. Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary in accordance with Class G, Grade 5 of the National Joint Board Salary Agreement, commencing at £831.

Apply to the District Manager, Luton, Eastern Electricity Board, 487, Dunstable Road, Luton, Beds.

SERVICE CENTRE ASSISTANT (Male or Female), FENS SUB-AREA, PETERBOROUGH (111/54.R). Candidates should preferably have experience of electrical appliances and an aptitude for selling. Possession of the E.D.A. Diploma would be an advantage.

Salary in accordance with the General Clerical Grade of the National Joint Council Salary Agreement on the scale for males £170-£470 and for females £138-£380, the commencing point depending on age and ability.

Apply to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

DEMONSTRATOR, NORFOLK SUB-AREA, NORWICH DISTRICT (117/54.N). Candidates should have had domestic science training, including electrical housecraft, should preferably hold the E.A.W. Certificate and be competent to plan and give cookery demonstrations, including lectures and advice to consumers on the utilisation of domestic electrical apparatus. Previous experience in an electricity service centre is desirable.

Salary in accordance with Grade 1 (£400 × £20 to £480 × £10 to £490) of the National Joint Council Salary Agreement, although progress beyond £440 will be subject to a certificate that the person concerned is capable of undertaking all the duties of the grade.

Apply to the District Manager, Norwich, Eastern Electricity Board, Duke St., Norwich, Norfolk.

SENIOR DRAUGHTSMAN & ENGINEERING DRAUGHTSMAN, NORTHMET SUB-AREA HEADQUARTERS (115/54.R). The duties include layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33 kV.

Salary in accordance with the National Joint Board Salary Agreement as follows:—

Senior Draughtsman: Schedule D, Grade 5, £567-£671 plus London allowance.

Engineering Draughtsman: Schedule D, Grade 6, £433-£567 plus London allowance.

Apply to the Manager, Northmet Sub-Area, Eastern Electricity Board, Northmet House, Southgate, London, N.14.

GENERAL ASSISTANT ENGINEERS required in the following localities:—

(1) North Essex District, Essex Sub-Area (112/54.R).
(2) Letchworth, Stevenage District, Northmet Sub-Area (113/54.R).
(3) Two: St. Albans and Welwyn Garden City District, Northmet Sub-Area (114/54.R).

Candidates should have had a sound training in electrical engineering and experience in the construction, operation and maintenance of overhead and underground distribution systems, including substations.

Salary in accordance with the National Joint Board Salary Agreement as follows:—

(1) Class E, Grade 11, commencing at £524.
(2) Class E, Grade 11, commencing at £524.
(3) Class F, Grade 11, commencing at £548.

Apply as follows:—

(1) The District Manager, Eastern Electricity Board, Cressing Road, Braintree, Essex.
(2) The District Manager, Eastern Electricity Board, 38, High Street, Stevenage, Herts.
(3) The District Manager, Eastern Electricity Board, 107, St. Peter's Street, St. Albans, Herts.

JUNIOR ENGINEERS required in the following localities:—

(1) Bishop's Stortford District, Northmet Sub-Area (118/54.R).
(2) King's Lynn & Western District, Norfolk Sub-Area (119/54.R).
(3) Fens Sub-Area Headquarters, Cambridge (120/54.R).

Candidates should have had a good general and technical education and possess the Higher National Certificate or an equivalent qualification.

Salary in accordance with the National Joint Board Salary Agreement as follows:—

(1) Class D, Grade 14, at £423.
(2) Class E, Grade 14, at £445.
(3) Class H, Grades 17-14, within a range of £402-£516, commencing at a point dependent upon qualifications and experience.

Apply as follows:—

(1) The District Manager, Eastern Electricity Board, 25, North Street, Bishop's Stortford, Herts.
(2) The District Manager, Eastern Electricity Board, Gaywood Bridge, Wootton Road, King's Lynn, Norfolk.
(3) The Manager, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge.

Future salary and conditions of service for all these appointments will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the Manager concerned within 14 days of the appearance of this advertisement.

4648

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Principal: H. Baker, Ph.D., A.M.I.C.E., A.M.I.Mech.E.

APPLICATIONS are invited for the post of ASSISTANT LECTURER, GRADE A, IN ELECTRICAL ENGINEERING. A recognised qualification such as the Higher National Certificate is desired, and preference will be given to candidates having wide industrial experience. The teaching will include general electrical subjects to Ordinary National Certificate level and, if possible, craft subjects to the level of the Intermediate City & Guilds. In the case of a suitable applicant some teaching at higher levels can be included if desired.

Salary in accordance with the Burnham Scale for Technical Teachers.

Further particulars and forms of application may be obtained from the Registrar, Nottingham & District Technical College, Shakespeare Street, Nottingham, and should be returned to him not later than 31st August, 1954.

F. STEPHENSON,
Clerk to the Joint Education Committee.

10th August, 1954. 4586

CITY COUNCIL OF SINGAPORE

Electricity Department

APPLICATIONS are invited for the post of JUNIOR TECHNICAL ASSISTANT in the City Electricity Department on 3 years' agreement in the first instance. On satisfactory completion of the agreement the appointee would normally be offered emplacement on the permanent establishment.

Applicants must be Graduate Members of the Institution of Electrical Engineers or possess the Higher National Certificate (Electrical) or equivalent. They must also have experience in technical planning of high and low-voltage transmission and distribution networks, substations, transformers and switchgear, etc., and knowledge of high-voltage generating plant and control equipment. Minimum age 28 years.

The salary offered is $870, $910, $950 a month for the 1st, 2nd and 3rd year respectively in the salary scale $870 × $40 to $990. Expatriation and cost-of-living allowances are also payable.

If placed on the permanent establishment after satisfactory completion of the agreement the basic salary will be $990 per month in the scale $870 rising to $990 per month (£1,218 to £1,386 per annum).

Expatriation allowance payable is £315 per annum on basic salary of $870 a month and £343 per annum on basic salary between $871 and $990 a month.

Cost-of-living allowance payable at present is £238 per annum on basic salary between $870 to $910 a month and £224 per annum on basic salary between $950 and $990 a month for a single man; £385 per annum on basic salary between $870 and $990 a month for a married man; £560 per annum on basic salary between $870 and $990 a month for a married man with one or more children. A dependent child means an unmarried child, including a step-child or a legally adopted child, under the age of 17, or receiving full-time educational instruction and below the age of 21.

For a single man the minimum total emoluments on a basic salary of $870 a month would amount to £1,771 per annum; for a married man with no children £1,918 per annum, and for a married man with one or more children £2,093 per annum.

The exchange rate is approximately $1 to 2s. 4d. sterling.

Partly furnished quarters provided if available at 6% basic salary or housing allowance of 10% of basic salary (subject to a maximum of $120 per month) paid in lieu.

Free passages will be provided for appointee, his wife, and his own children under the age of 12 years at the date of sailing, subject to a maximum of three full passages.

One month leave per year of service may be granted on satisfactory completion of agreement at the discretion of the Council. If placed on the permanent establishment on completion of the agreement the appointee will be required to serve a further year before proceeding on leave. The present rate of leave is four days per month of resident service. Local leave of 14 days a year cumulative to a maximum of 28 days may also be granted.

Compulsory provident fund contributions at present 7½% of salary (but not allowances), to which the Council donate 7½% rising to 10% after 10 years' service, 15% after 15 years' service, and 20% after 20 years' service. This scheme is under review.

Further details from the Council's London agents: Messrs. Allen & Williams, 1, Victoria Street, Westminster, London, S.W.1. Full applications in duplicate to be submitted before Tuesday, 14th September, 1954. 4619

OPPORTUNITY FOR DRAUGHTSMEN

THE continued expansion of this company has created openings for a few draughtsmen to join us.

We offer good prospects in congenial surroundings for:—

ELECTRICAL DRAUGHTSMEN with experience in design of circuits and equipment.

Also DRAUGHTSMEN for our Layout and Engineering Departments.

Apply in writing to Personnel Manager, The Express Lift Co. Ltd. (controlled by the General Electric Co. Ltd.), Abbey Works, Northampton. 4653

YORKSHIRE ELECTRICITY BOARD

No. 3 (Sheffield) Sub-Area

ROTHERHAM/MEXBOROUGH DISTRICT.

DISTRICT COMMERCIAL ENGINEER. Applicants must be conversant with all matters connected with the commercial organisation of an electricity supply undertaking in a district consisting of a heavy industrial and densely developed residential area surrounded by a rural area.

Experience in negotiations with large power consumers, load development, electrical contracting, preparation of statistics and reports; organisation of consumers' records and the control of staff will be an advantage.

Preference will be given to candidates who are Corporate Members of the I.E.E. The successful candidate will be required to live in the district.

Salary N.J.B. Class J, Grade 4, £1,026/£1,071 per annum.

SUB-AREA HEADQUARTERS.

GENERAL ASSISTANT ENGINEER (Civil). Applicants should possess the Higher National Certificate in Civil Engineering, and must be qualified by training and experience for the supervision of civil works on site by direct labour and to act as Clerk of Works where the work is carried out by contract.

Specialised experience in the construction of large electricity substations will be an advantage.

Salary N.J.B. Class N, Grade 13, £692/£716 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, not later than 3rd September, 1954.

No. 1 (Bradford) Sub-Area

THIRD ASSISTANT ENGINEER (Construction and Maintenance). Applicants should be Corporate Members of the Institution of Electrical Engineers or hold other acceptable technical qualifications, and should have good experience in the construction and maintenance of extensive complete overhead and underground systems operating at voltages up to 66 kV. The post involves participation in standby duties.

Salary N.J.B. Class K, Grade 10, £719/£750 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Rd., Bradford, not later than 3rd September, 1954.

No. 6 (Hull) Sub-Area

GOOLE DISTRICT.

THIRD ASSISTANT DISTRICT ENGINEER (Pocklington). Applicants should hold the Higher National Certificate in Electrical Engineering or equivalent qualifications, and have had experience in the construction, operation and maintenance of E.H.T. and L.T. overhead and underground distribution systems in a rural district.

The successful applicant will be required to reside in Pocklington and undertake standby duty.

Salary N.J.B. Class E, Grade 9, £587/£600 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 3rd September, 1954.

No. 5 (Wakefield) Sub-Area

WAKEFIELD DISTRICT.

GENERAL ASSISTANT DISTRICT ENGINEER. Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district, and undertake standby duties.

Applicants must hold at least Higher National Certificate in Electrical Engineering.

Salary N.J.B. Class F, Grade 11, £548/£565 per annum.

SUB-AREA HEADQUARTERS.

ENGINEERING DRAUGHTSMAN-SURVEYOR. Applicants must be able to undertake the preparation of final and working drawings connected with the erection and equipment of substations, and must have a sound knowledge of industrial and commercial building construction. They must have had experience in the use of surveying instruments and in site survey.

Salary N.J.B. Schedule D, Grade 6, £433/£567 per annum. Entry to the grade will be in accordance with capabilities and experience.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a, Denby Dale Road, Wakefield, not later than 3rd September, 1954. 4615

NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT of JUNIOR ENGINEERS (TESTING ASSISTANTS), TESTING STATIONS, ARDWICK & SALFORD. Applicants should have had experience of testing metering or protective equipment and should hold the O.N.C. in Electrical Engineering.

Salary scale £402/£544 p.a., Grades N.22/18, N.J.B. conditions.

Appointment of GENERAL ASSISTANT DISTRICT ENGINEER, EAST DISTRICT, CHORLTON-ON-MEDLOCK. The duties will include assistance on substation construction, maintenance and operation and the keeping of the necessary records, but the duties will not be restricted to this class of work. Applicants should have received technical training to H.N.C. level, and should have had practical experience on substation work, operation, cable laying and jointing, etc. Corporate membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £573/£596 p.a., Grade G.11, N.J.B. conditions.

Applications for the above posts to Sub-Area Secretary, No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 28th August, 1954.

Appointment of ENGINEERING DRAUGHTSMAN, NORTH WEST FYLDE DISTRICT, FLEETWOOD. Applicants should preferably have experience in the preparation of plans for new and existing buildings, electrical network diagrams and the layout and construction of substations. The possession of a Technical Certificate in Electrical or Mechanical Engineering will be an advantage.

Salary scale £433/£567 p.a., Schedule D, Grade 6, N.J.B. conditions.

Applications to Sub-Area Manager, No. 4 Sub-Area, North Western Electricity Board, 40/41, Lune Street, Preston, by 28th August, 1954.

Appointment of GENERAL ASSISTANT ENGINEER (METERS AND PROTECTION), SUB-AREA ENGINEER'S DEPT., CARLISLE. The successful applicant will be required to carry out general testing duties in a Class A testing station. Some knowledge of the testing and routine maintenance of protective gear and the use of high-voltage pressure testing equipment is necessary.

Salary scale £552/£573 p.a., Grade J.13, N.J.B. conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, by 28th August, 1954. 4585

WOOLWICH POLYTECHNIC, LONDON, S.E.18

Principal: J. S. Tait, Ph.D., B.Sc., A.R.T.C., M.I.E.E., A.M.I.Mech.E.

APPLICATIONS are invited for the post of ASSISTANT GRADE B in the Electrical Engineering Department. Applicants should possess a good degree in electrical engineering and some industrial experience. Duties commence in September, 1954, or as early as possible thereafter.

Salary scale: Burnham Further Education Scale between £450 and £839 according to qualifications and experience, plus London allowance.

Particulars and application form from Clerk to Governors, to be returned by the 6th September, 1954. 4617

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

INSTRUMENT ENGINEER, FULHAM GENERATING STATION (Vacancy No. 54/665). Applicants should have received a sound technical training and duties will cover maintenance, calibration and repair of boiler house and turbine house instruments for steam and water flows, and general instruments. Salary Class L, Grade 12 = £700 7s. p.a.

ASSISTANT ENGINEER (TECHNICAL), LOMBARD ROAD GENERATING STATION (Vacancy No. 54/666). Applicants should have received a sound technical training and should be conversant with the preparation of routine operating returns, and preferably have some knowledge of instrument maintenance. Salary Class F, Grade 12 = £532 7s. p.a.

SHIFT CHARGE ENGINEER, LOMBARD ROAD GENERATING STATION (Vacancy No. 54/667). Applicants should have a sound technical education, with experience in operation of boiler house and turbine room plant. Salary Class F, Grade 7 = £731 17s. p.a.

SHIFT CHARGE ENGINEER, ST. PANCRAS GENERATING STATION (Vacancy No. 54/668). Practical experience in efficient operation of medium pressure turbine and boiler plant, also E.H.T. switchgear. Character and ability to supervise all grades essential. Salary Class E, Grade 7 = £681 9s. p.a.

Application, quoting vacancy number, may be made on the form obtainable from Divisional Secretary, British Electricity Authority, London Division, P.O. Box 136, Generation House, Great Portland Street, London, W.1, and be received within 14 days of this advertisement. 4639

SALES MANAGER

IMPORTANT British company with branches throughout the U.K., selling specialised equipment to business, professional firms, needs a really capable, experienced and industrious SALES MANAGER. The right man must have earned at least £2,000 p.a., and must feel himself well worth and capable of rising to £3,000 p.a.

The man for whom we are looking may now be an Assistant Sales Manager, whose ambition it is to become Sales Manager. He need not have technical knowledge of the equipment, but must have experience in selling and advertising speciality articles. Would reside in London.

Reply in confidence with full details of experience and qualifications to "Managing Director."—Box 4594.

BRITISH ELECTRICITY AUTHORITY

North West, Merseyside and North Wales Division

VACANCY No. 143/54: STATION SHIFT CONTROL ENGINEER, Huncoat Generating Station, near Accrington. Salary £577/£598 (F.10).

Vacancy No. 148/55: STATION SHIFT CONTROL ENGINEER, Westwood Generating Station, near Wigan. Salary £608/£630 (G.10).

Apply, quoting vacancy number, to Controller, British Electricity House, 825, Wilmslow Road, Manchester, 20, before 28th August. 4620

STATION ENGINEERS AND STATION ENGINEERS (MECH.)

required by Air Ministry at R.A.F. and M.C.A. stations.

Qualifications and experience required: (a) Ordinary National Certificate in either electrical or mechanical engineering as appropriate, or equivalent standard of technical education; (b) Recognised apprenticeship in either electrical and/or mechanical engineering; (c) Three years' responsible engineering employment, preferably on operation and maintenance of mine, factory or workshop plant and services. Supervisory and cover installation, operation and maintenance of high and medium-voltage distribution system, internal electrical installations, diesel and boiler house plant, steam and hot water heating systems, and other miscellaneous installations, tools and equipment.

Station Engineers (Mech.) duties are of more specialist nature and cover mechanical items only.

Commencing salary according to age, qualifications and experience (normally £550 at age 28 or over), on the range £510-£640. Appointments include liability for service overseas, for which special allowance payable in addition to higher salary. Appointments non-pensionable. Only natural-born British subjects.

Write giving date of birth, education, full details of qualifications and experience of posts held (including dates) to E.A.1564, Appointments Officer, Ministry of Labour and National Service, 1-6, Tavistock Square, London, W.C.1, by 4th September, 1954. No original testimonials should be sent. Only candidates selected for interview will be advised. 4554

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following position within the Division:—

THIRD ASSISTANT ENGINEER, TRANSMISSION CONSTRUCTION DEPARTMENT (OVERHEAD LINES) DIVISIONAL HEADQUARTERS (Vacancy No. 121/54/ER).

Preference will be given to applicants who are Corporate Members of either the Institution of Civil, Electrical or Mechanical Engineers, or who hold equivalent qualifications and have had experience in construction of E.H.T. transmission lines in the field from initial profile to final sag checking.

The salary will be within Schedule C, Class AX/DX, Grade 5 (£649-£858 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 26th August, 1954.

This appointment will be pensionable within the terms and provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote vacancy number.

L. F. JEFFREY,
Divisional Controller.

13th August, 1954. 4649

BRITISH ELECTRICITY AUTHORITY

Southern Division

DIVISIONAL TECHNICAL ENGINEER required. Candidates should preferably be Corporate Members of the Institution of Electrical Engineers and have had wide experience of electro-technical matters, including system development, testing and commissioning of electrical plant and equipment including switchgear and transformers, and also protective, metering and telecommunication equipment.

The successful candidate will be required to exercise administrative control over the Technical Department at Divisional Headquarters, Portsmouth, and be responsible to the Divisional Controller.

Applicants should preferably have held previous positions of responsibility giving experience in all sections referred to.

Salary within N.J.M. Scale 4, £1,600-£1,750.

Applications, stating age, present position and salary, full details of qualifications and experience, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by the 4th September, 1954. Quote ref. ER/505. 4587

SOUTH EASTERN ELECTRICITY BOARD

SENIOR SHOWROOM ASSISTANT, Kingston and District.

Salary £485 × £20 to £545 under N.J.C. Grade 2, plus London weighting. Superannuable. The successful applicant will be primarily in charge of the Weybridge showroom and responsible to the district commercial engineer, but may be required to work at any of the district's showrooms. Applicants should have had experience in an electricity supply showroom and be capable of advising consumers on apparatus.

Applications on forms from D.C. Thomson, B.Sc., M.I.E.E., Kingston and District Manager, SEEBoard, 22, Claremont Rd., Surbiton, Surrey to be returned naming 2 referees by 1st September, 1954.

JUNIOR ENGINEER, Medway District.

Salary £466 p.a. under N.J.B. Class F, Grade 14. Superannuable. Applicants to hold the Higher National Certificate for Electrical Engineering or equivalent, and had training and experience in underground and overhead distribution. The position will eventually entail standby duties.

Applications naming 2 referees, to Ramsden Mellor, M.I.E.E., District Manager, SEEBoard, Gardiner Street, Gillingham, Kent by 1st September, 1954.

A. L. BURNELL,
Secretary.

4652

SOUTH WEST SCOTLAND ELECTRICITY BOARD

Lanarkshire Sub-Area

Appointment of Third Assistant District Engineer Rutherglen District

APPLICATIONS are invited for the appointment of THIRD ASSISTANT DISTRICT ENGINEER, Rutherglen District.

Candidates should preferably be Graduates of the Institution of Electrical Engineers or hold equivalent qualifications. They should have had a sound engineering training with subsequent experience in the operation and maintenance of H.V. and L.V. switchgear and overhead and underground distribution systems.

The salary and conditions of service for this appointment will be in accordance with the National Joint Boards Agreement, Schedule A. The present classification and grading will be E 9, salary £587/£600 per annum, which will be subject to the statutory deductions, including superannuation.

Application forms, which may be obtained from the undersigned, should be returned to this office within 14 days of the date of this notice.

DUGALD SMITH,
Manager.

137, Almada Street,
Hamilton.
19th August, 1954. 4650

MINISTRY OF TRANSPORT AND CIVIL AVIATION

Telecommunications Technical Officers, Grade III

THE CIVIL SERVICE COMMISSIONERS invite applications from men for at least three pensionable posts. Age at least 23 and under 28 on 1st August, 1954, with extension for regular service in H.M. Forces.

Candidates must possess (a) the O.N.C. in Electrical Engineering, or (b) City and Guilds Intermediate Certificate in Telecommunications Engineering, plus City and Guilds Certificate Radio III, or (c) City and Guilds Certificates Telecommunications Principles III (or higher) anad Radio III (or higher), or (d) produce evidence of an equivalent standard of technical education. They must also have not less than eight years' experience in an appropriate telecommunications field, including manufacturing or maintenance or operation.

London salary £480 (at age 23) to £670 (somewhat lower in Provinces). Starting pay up to £580 at age 28 or over on entry. Promotion prospects.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30, Old Burlington Street, London, W.1, quoting No. S207/54. Application forms must be returned by 8th October, 1954. 4591

CITY OF LIVERPOOL

City Engineer and Surveyor's Department

APPLICATIONS are invited for the appointment of ELECTRICAL ENGINEER. Salary, £580 × £15 × £20 to £670 per annum (A.P.T. Grades IV/V).

Applicants should hold the Higher National Certificate in Electrical Engineering or other appropriate qualification, be capable of preparing specifications, schemes and estimates for complete lighting and power installations, and modification and improvement of installations in schools and supervising the work under construction.

Application forms, obtainable from the City Engineer and Surveyor, Municipal Buildings, Liverpool, 2, should be returned to him by the 10th September, 1954.

The appointment is superannuable and subject to the Standing Orders of the City Council. Canvassing disqualifies.

THOMAS ALKER,
Town Clerk.

Municipal Buildings,
Liverpool, 2.
(J.A.3653). 4654

WANTED

P.A. EXPERT

FIRST-CLASS MAN required by important British Telephone Company in London to develop department handling Public Address Equipment for installation in factories and business premises. He should have full technical knowledge and be able, in addition, to explain and sell the equipment to prospective customers. This is a big opportunity for a man who can make his department grow.

Write with full details of qualifications, experience and salary required to Managing Director. — Box 4623.

DESIGN ENGINEERS

THE ENGLISH ELECTRIC CO. LTD. invite applications for the following positions in their Mechanical Engineering Department at Luton:—

SENIOR DESIGN ENGINEERS. Age 28-35. Minimum qualifications H.N.C. standard with sound engineering training and experience. Applicants must be capable of initiating original designs, and some supervisory experience would be an advantage but not essential.

JUNIOR DESIGN ENGINEERS. Age 24-38. O.N.C. standard, to work in conjunction with Senior Engineers developing designs to a fully completed stage. A sound knowledge of workshop practice is desirable.

All positions require a thorough drawing office background in light/medium mechanical or electro-mechanical engineering. Successful applicants would be engaged on the original design of a wide variety of laboratory equipment, test rigs and specialised machines. Good salaries and conditions for the right men. Apply to Dept. C.P.S., 336/7, Strand, London, W.C.2, quoting ref. 1261A. 4341

COUNTY OF LEICESTER

ASSISTANT ELECTRICAL ENGINEER, £550-£595. Should have sound knowledge electrical installation work and experienced in preparing reports, specifications and estimates. Must have Higher National Certificate in Electrical Engineering or Section A Certificate of the Institution of Electrical Engineers.

Apply by 6th September on form obtainable from County Architect, 123, London Road, Leicester. 4689

FERRANTI LTD.

invite applications for the following vacancies in their Power Transformer Department:—

(1) ENGINEERS FOR DESIGN AND DEVELOPMENT work in large transformers, voltage regulators and specialised high-voltage equipment. Qualifications include a degree or H.N.C. in electrical engineering and previous design or development experience in power engineering. (Ref. TE.)

(2) DRAUGHTSMEN (ELECTRICAL OR MECHANICAL) with previous experience in power engineering. (Ref. TD.)

Applications are also invited from young graduates completing National Service either for direct employment or for practical works training. (Ref. TG.)

Vacancies also exist for graduate-apprentices wishing to undertake a planned two-year course of training for design, research and development, production or sales, prior to National Service. (Ref. PGA.)

The company operates a staff pension scheme. Application forms from Mr. T. J. Lunt, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. quote appropriate reference. 4377

BRITISH ELECTRICITY AUTHORITY

Commercial Dept., Headquarters

GENERAL ASSISTANT AND JUNIOR ENGINEERS required. The duties, which provide scope for enterprise and initiative, are concerned with tariffs and the commercial development of the electricity supply industry and extend from generation to utilisation.

Candidates should be capable of undertaking studies of wide general interest to the industry, and preference will be given to those who have some practical experience in electricity supply and in economic investigation. An engineering degree or Higher National Certificate in Engineering would be an advantage.

Salaries, including London allowance: General Assistant Engineers, N.J.B. Grade 5, £558-£769 p.a.; Junior Engineers, £415-£636.

Applications, stating age, present position and salary, and giving full details of qualifications and experience, to D. Moffat, Director of Establishments, British Electricity Authority, Winsley Street, London, W.1, by 4th September, 1954. Quote ref. ER*/506. 4640

CROMPTON PARKINSON LTD.

invite applications for the following posts in the F.H.P. MOTOR DEPARTMENT at its Doncaster factory:—

1. DRAUGHTSMAN for work on the mechanical design of F.H.P. Motors.
2. ASSISTANT for the Works Laboratory and Experimental Section.
3. ASSISTANT for the Production Test Department.

Candidates, aged 23-26, should have obtained the Ordinary or Higher National Certificate in appropriate technical subjects and should preferably have had previous production or test experience.

The posts are staff appointments carrying opportunities for advancement.

The company operates a superannuation scheme to which employees contribute when eligible. Salaries paid will be according to age, qualifications and experience.

Applications, stating age and giving details of past experience, should be sent to the Personnel Officer, Crompton Parkinson Ltd., Wheatley, Doncaster, Yorks. 4625

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

APPLICATIONS are invited for ENGINEERING DRAUGHTSMEN at Divisional Headquarters, Kingston, who have ambition for progress by merit, and have the necessary educational requirements to be capable after training of carrying out all necessary design calculations on mechanical or electrical plant. Good technical college facilities. N.J.B. conditions of service. Salary according to ability within range of £458-£595 7s. p.a., including London allowance.

Detailed written applications should be received by the Establishments Officer, British Electricity Authority, Lower Ham Road, Kingston-on-Thames, by 28th August, 1954. 4641

BRITISH ELECTRICITY AUTHORITY

Midlands Division

THIRD ASSISTANT ENGINEER (Civil) is required in the Transmission Department at Divisional Headquarters. National Joint Board service conditions, superannuable appointment, salary within Schedule C, Grade 5, of the Agreement, £649-£858 per annum.

Applicants should have received a thorough training in civil engineering and preferably have passed parts A and B of the examination for Associate Membership of the Institution of Civil Engineers, or hold qualifications exempting them therefrom. They should have had experience in the design, setting out and supervision of site works, foundations, buildings and reinforced concrete structures, and should be accustomed to dealing with specifications, bills of quantities, drawings and correspondence relating thereto.

Apply, quoting Vacancy No. 738MD, on form AE6, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by 28th August, 1954. 4636

DRAUGHTSMEN

DRAUGHTSMEN required by Ministry of Supply at various locations, with experience in any of the following classes of work: Chemical plant, light or heavy mechanical, automobile, precision instrumentation, radio, radar, electrical, electronics, structural, building, jig and tool. At least 3 years' workshop training and O.N.C. or equivalent.

Starting pay (Provincial) £380 (age 20) to £550 (age 28), rising to £640. London rates higher. Paid sick leave; 20 days' annual holiday plus public holidays; 44-hour week (generally 5-day), including meal breaks. Payment for overtime.

Appointments unestablished but opportunities to compete for pensionable posts. Prospects of promotion to Leading Draughtsman, £635-£742 (Prov.), thence to Senior Draughtsman, £742-£910 (Prov.), and Chief Draughtsman, £960-£1,120 (Prov.).

Write, stating age, training, qualifications and experience to Ministry of Supply, Est. 3(c)1, Room 519, Carlton Hotel, Haymarket, London, S.W.1. 4553

COLLEGE OF TECHNOLOGY, BIRMINGHAM

Department of Electrical Engineering

APPLICATIONS are invited for the post of ASSISTANT GRADE B to teach to Higher National Certificate standard.

Candidates should have a degree in electrical engineering and experience in an electrical engineering capacity. Previous teaching experience an advantage.

Salary will be in accordance with the Burnham (Further Education) Scale for Grade B Assistants: (Men) £525 × £25 to £820; (Women) £475 × £20 to £655.

Further particulars and forms of application may be obtained from the Registrar, College of Technology, Suffolk Street, Birmingham, 1, on receipt of a stamped addressed foolscap envelope. Completed forms should be returned not later than two weeks after the appearance of this advertisement.

K. R. PILLING,
Clerk to the Governing Body.
4589

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

APPLICATIONS are invited for the position of STATION CLERK for Croydon A & B Power Stations. Applications should give proof of considerable experience in costing and industrial wage calculations. It is preferable that applicants should have passed an Intermediate examination in relative subjects. Ability to organise and control staff essential. A knowledge of mechanised accounting and the negotiating machinery of industry would be an advantage.

N.J.C. conditions of service, Grade 5, £670-£730 p.a. plus 5% London allowance.

Applications, giving details of education, present position, experience, etc., should be sent to Station Superintendent, Croydon B Power Station, Beddington Farm Road, Croydon, by 28th August. 4588

LONDON ELECTRICITY BOARD

Engineering Draughtsmen

APPLICATIONS are invited for positions as ENGINEERING DRAUGHTSMEN for electrical plant layout in the Drawing Office of the Chief Engineer's Department in Central London.

Applicants should preferably have served an engineering apprenticeship and have had technical training. Experience in the layout of transforming plant, H.V. switchgear and cables would be an advantage.

The posts are graded under Schedule D of the N.J.B. Agreement as Grade 6 (£458 to £595 7s. per annum, inclusive of London allowance) and the commencing salaries will be dependent upon qualifications and experience.

Application forms, obtainable from Personnel Officer, 46, New Broad Street, London, E.C.2, to be returned completed not later than 31st August, 1954. Please enclose addressed envelope and quote ref. V/1736/R on envelope and all correspondence. 4569

MECHANICAL AND ELECTRICAL ENGINEERS

THE following vacancies exist for senior engineers on the staff of a well-known medium-sized company in the Slough area:—

1. Graduate Engineer with not less than five years' experience on the design and operation of process control equipment.
2. Graduate Engineer with not less than five years' general works experience, preferably with not less than two years on design of small mechanisms. Must be familiar with drawing office practice and have some knowledge of the common manufacturing processes.
3. Engineer of degree standard with six or more years' experience on the design of valves for the control of fluids.

All the above positions are permanent and offer excellent opportunities in an expanding field for men of initiative. Apply, giving details of qualifications and experience, together with salary required, to—Box 4593.

CHIEF ELECTRONIC ENGINEER

THE R. Y. PICKERING Group of Companies, which is considerably expanding its ELECTRONIC DIVISION, has a vacancy for a CHIEF ELECTRONIC ENGINEER and invites applications for this position.

Applicants must possess a university degree and have experience in research, development and production of electronic and similar apparatus, and some administrative experience is desirable.

Salary will be in accordance with qualifications, experience and age, and will be upwards of £2,000 per annum, and certain amenities may be provided. The post offers considerable scope, will be progressive, and will suit an engineer rather than a physicist.

Further information will be given on request and applications in writing in the first instance should be made to the Managing Director, R. Y. Pickering & Co. Ltd., Netherton Works, Wishaw, Lanarkshire, and will be treated in strict confidence. 4556

RADIO TECHNICIAN

required as SIGNALS ASSISTANT INSPECTOR OF POLICE by NYASALAND GOVERNMENT for one tour of 2-3 years, with prospect of permanency.

Salary scale (including present temporary allowance of approx. 13% of salary) £651 rising to £1,103 a year. Commencing salary according to experience. Outfit allowance £50. Uniform allowance £10 a year. Free passages. Liberal leave on full salary.

Candidates must be between 21 and 30 years of age, of good education and physique, not below 5′ 7″ in height, normal vision without glasses. They must have a sound knowledge of H.F. and V.H.F. fixed and mobile simplex and duplex radio telephone systems and low power petrol/electric chargers and alternators. Knowledge of Morse and ability to instruct trainees in radio subjects desirable.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M1/36023/EF. 4618

ASSISTANT LECTURER (ELECTRICAL ENGINEERING)

required by NIGERIA EDUCATION DEPARTMENT for two tours of 18 to 24 months or three tours of 10 to 12 months in the first instance.

Option of appointment either (a) on agreement with prospect of permanency with salary scale (including expatriation pay) £750 rising to £1,315 a year or (b) on contract with salary scale (including expatriation pay) £807 rising to £1,453 a year plus gratuity at the rate of £100/£150 a year. Outfit allowance £60. Free passages for the officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K.

Candidates should possess the H.N.C. in Electrical Engineering or equivalent qualification and have had previous teaching and industrial experience.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30630/EF. 4659

BRITISH ELECTRICITY AUTHORITY

South Wales Division

Vacancy No. 83/54

APPLICATIONS invited for superannuable N.J.B. appointment of GENERAL ASSISTANT ENGINEER, Technical Dept., Divisional Headquarters. Salary AX/CX.8, £501-£675 per annum.

Candidates should possess a degree or H.N.C. in Electrical Engineering; some experience in the manufacture, design or erection of high-voltage transmission equipment desirable. Required to assist in the design of a 132-kV transmission system and in the investigation of a wide range of system problems, including fault calculations and load flow studies.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-Fedwen Road, Gabalfa, Cardiff, by 30th August, 1954. 4621

BRITISH ELECTRICITY AUTHORITY

Midlands Division

GENERAL ASSISTANT ENGINEER is required in the System Operation Department at Divisional Headquarters. National Joint Board service conditions, superannuable appointment, salary within Schedule C, Grade 8, commencing in the range £501 to £639, ultimately rising to £714 per annum.

Duties are of a general statistical and technical nature, associated with the group operation of power stations, and the successful applicant will be required to carry out shift duties as necessary in the system control room. Power station experience and appropriate technical qualifications will be considered advantageous.

Apply, quoting Vacancy No. 739MD, on form AE6, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by 28th August, 1954. 4637

THE UNIVERSITY OF MANCHESTER

APPLICATIONS are invited for the post of LECTURER IN ELECTRICAL ENGINEERING. Candidates should be graduates and should have qualifications and/or experience in measurements and/or heavy electrical engineering.

Salary on a scale £500-£1,100 per annum, with membership of F.S.S.U. and children's allowance scheme. Initial salary according to qualifications and experience.

Applications should be sent not later than 22nd September, 1954, to the Registrar, The University, Manchester, 13, from whom further particulars and forms of application may be obtained. 4616

SOUTH WALES ELECTRICITY BOARD

SURVEYOR DRAUGHTSMAN required in the West Central Sub-Area at Fforestfach.

Salary, Schedule D (£433/£567) of N.J.B. Agreement.

Applications stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 28th August, 1954.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. 4651

DIESEL ELECTRIC SUPERVISOR

required by the NIGERIA RAILWAY for one tour of 18/24 months in the first instance.

Appointment either (a) on contract terms with salary scale (including expatriation pay) £1,170 rising to £1,453 a year plus gratuity at rate of £150 a year or (b) with prospect of permanency with salary scale (including expatriation pay) £1,085 rising to £1,315 a year. Outfit allowance up to £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in United Kingdom. Liberal leave on full salary.

Candidates should have served an apprenticeship with a manufacturer of electric traction equipment or with an electric traction department of a railway and have had at least seven years' subsequent workshop experience in the overhaul and operation of traction equipment.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30564/EF. 4658

THE QUEEN'S UNIVERSITY OF BELFAST

RESIDENT ENGINEER required to supervise, under the consulting engineers, the installation of specialist services (heating, ventilation, electrical equipment, etc.) in a large block of scientific buildings in Belfast.

The estimated date for completion of the contract is 31st March, 1958. There may then be an opportunity of appointment to a permanent post of maintenance engineer in the University. Salary not less than £600.

Letters of application should specify age, education, qualifications, past experience, present post, salary expected, and should name not more than three referees. Applications should be received by 20th September by the undersigned, from whom further particulars can be obtained.

G. R. COWIE, M.A., LL.B.,
Secretary. 4571

NORTHAMPTON POLYTECHNIC, LONDON, E.C.1

Department of Electrical Engineering

ELECTRICAL LABORATORY TECHNICIAN required. Salary 73s. 6d. per week at 16 years to £286 17s. 6d. at 20 years, and thence by annual increments of £19 2s. 6d. to £401 12s. 6d. p.a.

Post offers experience, training and education in all aspects of electrical engineering. Part-time day facilities available to study for degree or National Certificate.

Letters of application to Head of Department of Electrical Engineering. 4555

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

JUNIOR ENGINEER (Control), KINGSTON B POWER STATION. Applicants should preferably have had experience in the operation of E.H.T. switchgear and the parallel running of alternators.

N.J.B. conditions of service, Class G, Grades 16/14, commencing at £427 p.a., incl. London allowance.

Applications giving details of education, present position, experience, etc., to be sent to Station Superintendent, Kingston B Power Station, Downhall Road, Kingston-on-Thames, by 28th August. 4690

MIDLANDS ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEERS required in the Commercial Department of the Central Gloucestershire Sub-Area.

Previous experience in commercial or distribution activities an advantage. Technical qualifications desirable. Salary £523/£542 per annum (N.J.B. H13) or £565/£586 per annum (N.J.B. H12) according to experience. Superannuable.

Apply in writing within fourteen days to Mr. D. Holt, Sub-Area Manager, Central Gloucestershire, Midlands Electricity Board, 126, London Road, Gloucester.

A. STEPHENS,
Secretary. 4647

BRITISH ELECTRICITY AUTHORITY

COMBUSTION AND FUEL TECHNOLOGY Sub-Branch, London, require a SCIENTIST with a University Degree and Corporate Membership of the R.I.C. or the I.C.E. to work on boiler combustion problems as JUNIOR ASSISTANT to the Scientific Adviser.

Experience of power station practice will be an advantage, but is not essential. The successful candidate will acquire experience of power station boiler practice, particularly with relation to the coals burned, and also the microscopy of external boiler deposits.

Salary N.J.B. Grade 5, £558-£698, according to qualifications and experience, rising to £769 inclusive.

Applications, stating age, qualifications, experience, present position and salary, to D. Moffat, Director of Establishments, Winsley Street, London, W.1, by 6th September, 1954. Quote ref. ER*/507. 4622

MERSEY DOCKS & HARBOUR BOARD

APPLICATIONS are invited for an ELECTRICAL ENGINEERING DRAUGHTSMAN, experienced in preparation of specifications for high tension and low tension switchgear, motors, rectifiers, transformers, cable networks and lighting schemes; also examination of tenders received, arrangement of layouts and supervision of work on site.

Candidates must be between 36 and 40 years of age, and should have passed the examination of the Institution of Electrical Engineers.

Salary offered about £630 to £680 per annum, according to age. At the present time this salary qualifies for a cost-of-living bonus of 15%.

Applications should be addressed to the Engineer-in-Chief, Dept. E, Mersey Docks and Harbour Board, Dock Office, Liverpool, 3.

FRANCIS H. CAVE,
General Manager & Secretary. 4656

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS invited for positions of COMMERCIAL ASSISTANT in the following Districts of the Western Sub-Area:—

District 104—Lampeter.
District 105—Llandilo.

Applicants must have had experience in the application of electricity to domestic and commercial premises and all general purposes.

Salary Class C, Grade 10 (£502/£512/£521) of N.J.B. Schedule.

Applications, stating age, present position and salary, qualifications, experience and three referees, to be addressed to the Secretary to arrive by 28th August, 1954.

Previous applicants need not re-apply.

D. G. DODDS,
Secretary.

St. Mellons,
Cardiff. 4568

NORTH EASTERN ELECTRICITY BOARD

Harrogate Sub-Area

APPLICATIONS are invited for the appointment of GENERAL ASSISTANT ENGINEER, Harrogate. Duties will be in connection with new construction work and include survey for overhead lines, cables and substations and the preparation of technical details. Previous experience in this work desirable but not essential.

Salary, Schedule A, Class G, Grade 12, £534/£555. N.J.B. conditions of service.

Applications, stating age, qualifications and experience, should be forwarded to the Secretary (Establishments), North Eastern Electricity Board, P.O. Box 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 4646

RELAY MANUFACTURERS REQUIRE

(a) SALES ENGINEER to compile technical data and catalogues, deal with enquiries, etc.
(b) DRAUGHTSMEN.
(c) RELAY TESTERS.
(d) INSTRUMENT AND TOOL MAKERS.

Positions are initially at Kidbrooke, but we move shortly to Harlow, where HOUSES WILL BE AVAILABLE for all employees.

BESSON & ROBINSON LTD.
Kidbrooke Park Road, London, S.E.3 4595

UNIVERSITY OF GLASGOW

Lectureship in Electrical Engineering

APPLICATIONS are invited for a LECTURESHIP IN ELECTRICAL ENGINEERING. Salary scale £500 × £50 to £1,100. Initial salary according to experience and qualifications. F.S.S.U. and family allowance benefits. Teaching experience essential. Special knowledge of theory and operation of electrical machinery required.

Applications (5 copies), including the names of three referees, should be lodged not later than 11th September, 1954, with the undersigned, from whom further particulars may be obtained.

ROBT. T. HUTCHESON,
Secretary of University Court.
4527

LAURENCE, SCOTT & ELECTROMOTORS LTD.

Assistant Electrical Designers

TWO vacancies exist in the Design Department for young engineer having engineering degrees or equal in the design and application of variable speed A.C. machines and other special rotating electric machines.

Applicants should have completed or be exempt from National Service. Previous design experience would be an advantage. Good prospects of advancement exist for young men with ability and personality in the ever widening field of application of these machines. Attractive salary according to ability.

Write giving full particulars to the Secretary, Laurence, Scott & Electromotors Ltd., Gothic Works, Norwich, Norfolk. 4557

BRITISH ELECTRICITY AUTHORITY

Midlands Division

SHIFT CHARGE ENGINEER is required at Hams Hall B Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K7, £869 to £907 per annum.

Applicants should have received a sound technical training and power station practical experience in the operation and maintenance of steam generating plant, main switchgear and pulverised fuel firing. Appropriate qualifications an advantage.

Apply, quoting Vacancy No. 740MD, on form AE6, available from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, by 28th August, 1954. 4638

APPOINTMENT OF SALES MANAGER

Water Heating Department, Simplex Electric Co. Ltd.

APPLICATIONS are invited for the position of SALES MANAGER, Water Heating Department, which is located at the Blythe Bridge Factory, Near Stoke-on-Trent. Applicants, who should be between the ages of 30 and 45, must have had considerable experience in the electric water heating field, preferably in an executive capacity.

Applications in writing, giving full details of experience, qualifications and salary required, should be addressed to the Secretary, Simplex Electric Co. Ltd., Oldbury, Birmingham. 4657

SOUTH EAST SCOTLAND ELECTRICITY BOARD

JOINTER E.H.T. wanted for Berwick District, Southern Sub-Area. N.J.I.C. conditions. Present rate of pay 45 pence per hour. To reside in Berwick upon Tweed, where a Council house will be made available to the successful applicant on taking up the post.

Applications, stating age, whether married or single, and giving details of training and experience, should reach the Sub-Area Manager, South East Scotland Electricity Board, High Street, Galashiels, within 14 days. 4570

A MEDIUM-sized firm of cable makers require a methods engineer who is prepared to adapt existing plant and change methods where necessary. Technical knowledge is desirable but not essential.—Box 4596.

ARMATURE winder required, excellent conditions and rates, 20 mins. from Waterloo.—Max Arc & Electrics Ltd., Terrace Road, Walton-on-Thames, Surrey. 4598

A LARGE industrial organisation has a few vacancies for mechanical and electrical engineers. Further expansion is taking place and there is a need for men of ability who are ready to shoulder responsibility on the research, development and maintenance sides of the organisation. The appointments, which are permanent and pensionable, provide excellent opportunities for advancement. Postgraduate training leading to professional qualifications can be arranged, and normal salary will be paid during such training. Starting salaries in the range of £600-£900 per annum depending upon qualifications and experience. Candidates should hold an honours degree and be between 21 and 27 years of age. Write, giving full details of age, qualifications and experience, quoting advert. ref. Q9, to—Box 4440.

A WELL-known firm of electrical component manufacturers require able young man to take charge of small assembly section. Some electrical knowledge and ability to control female staff is essential. Modern factory in Wandsworth (London). Write, giving full details of experience, age and salary required, to—Box 94.

A WORKS superintendent required by rubber and plastic cable makers, well versed in modern production techniques.—Box 4597.

ALKALINE BATTERIES Ltd., of Redditch, are the largest makers in the Empire of alkaline accumulators, miners' lamps and emergency lighting systems, which are in rapidly growing use particularly for export. The company has vacancies in its technical sales and development sections for graduate electrical engineers, not over 30 years of age, or for men nearing the end of their degree course who have completed National Service. The posts are pensionable and offer the prospect of executive rank. Applications with full educational details and experience should be addressed—Commercial Manager, Alkaline Batteries Ltd., Union Street, Redditch. 3936

APPLICATIONS are invited by a prominent electrical manufacturing organisation from young men in the age group 25/30 years, who are interested in the sales of F.H.P. motors. Vacancies exist in London and the provinces for those who are seeking a position offering excellent opportunities of advancement and who possess initiative and drive. Apply in writing, supplying full details of training and experience, to—The Staff Manager, Box 4661.

APPLICATIONS are invited by The English Electric Co. Ltd., Stafford, from electrical or mechanical engineers for interesting development work on control systems for hoists. Applicants should have served an apprenticeship, possess an engineering degree and preferably have experience of control gear or servo techniques as applied to heavy engineering. Permanent staff appointments; pension scheme; assistance with accommodation. Apply, quoting ref. 769C, to—Dept. C.P.S., 336/7, Strand, London, W.C.2. 4663

ARMATURE and stator winder for f.h.p. motor repair shop req., also part-time or homework considered.—Ring PAD. 2967. 7565

ASSISTANT chief engineer required by company engaged in the design and development of guided weapons. Candidates must be mechanical engineers with first-class qualifications and experience in electronics and light engineering. Knowledge and experience in servo-mechanisms essential since duties would include responsibility for missile control systems, electrical gyros, accelerometers, etc. Applicants should be 30-35 years of age and have sufficient personality and experience to administer and organise the development activity on these subjects. Write in detail, quoting reference G, to—Box AC.91032, Samson Clarks, 57/61, Mortimer Street, London, W.1. 123

ASSISTANT manager required by progressive, well-established, electrical contractors, Norfolk. Experience of Air Ministry internal wiring an advantage. Good prospects for capable, hard-working executive with ultimate possibility of directorship. Must be able to handle work from estimate to final bill. Experience, age, in confidence to Chairman.—Box 4599.

BALL bearing manufacturer requires electrical engineer to develop the sale of bearings to makers of electric motors and similar equipment. Candidates should have had extensive experience in the electrical industry, and preferably some first-hand experience of the installation of bearings. Reply with qualifications to—Box 4443.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Company Ltd., 24, Fennel Street, Manchester, 4. The company requires additional electrical plant inspectors in one or two districts. Permanent positions carrying progressive salary scale £540 to £785 and non-contributory pension. Candidates, age 26 to 30 years, with apprenticeship in the manufacture or repair of electrical machinery, and preferably with subsequent experience of industrial use of electrical machinery, and who have gained the Higher National Certificate in Electrical Engineering or are Graduates of the Institution of Electrical Engineers, are invited to apply in own handwriting stating age, qualifications and experience. 4626

CASHIER/book-keeper required thoroughly experienced in all aspects of mechanised accounts department of London wholesalers. Excellent opportunity for right person, male or female. Write stating age, experience, salary required, to—Box 4664.

CHECKER (drawing office), 25-35 years, required by progressive electrical engineering firm, to cover the checking and relief of drawing. Good prospects for suitable applicant. 5-day week. Pension and life assurance scheme. Please apply in writing giving details of previous experience and salary required to—Personnel Manager, Ranco Ltd., Industrial Estate, Newhouse, Motherwell. 4688

CONSULTING engineers require electrical designer-draughtsman, age twenty-four to thirty-five; experienced in all classes of lighting and power installations for hospitals, schools, industrial projects; preparation of contract and specifications, etc. Good draughtsmanship essential. Reply to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 4386

COOKE & FERGUSON Limited, switchgear specialists, require designer-draughtsman with mechanical and/or electrical experience. A.E.S.D. rates paid to experienced men. Reply stating age, qualifications and experience to—Personnel Officer, Victoria Street, Openshaw, Manchester, 11. 4455

CROMPTON PARKINSON Ltd., Doncaster, wish to engage a diecasting methods engineer. Practical experience supplemented by technical training and knowledge of die design is essential. Experience in the diecasting of aluminium squirrel cage rotors is an advantage. The position offers splendid opportunity and scope for a man with ability. Good conditions and superannuation scheme. Apply giving full details of age, experience and salary required to—Ref. OP. 4624

CROMPTON PARKINSON Limited have a vacancy for a graduate in engineering who has completed his compulsory military service and needs practical training to help fit him for works and sales executive post. Applications to—MD/P(G), Crompton Parkinson Limited, Crompton House, Aldwych, London W.C.2. 4379

CROMPTON PARKINSON Ltd. have vacancies for both senior and junior draughtsmen at their Chelmsford works. Preference will be given to applicants having contract, development or diagram experience on switchgear up to 11 kV, but adaptable men having good electrical and mechanical experience will be considered. Conditions of employment are ideal and prospects are good. Apply, giving fullest particulars to the Personnel Officer, Crompton Parkinson Ltd., Chelmsford, Essex. 4665

CROMPTON PARKINSON Limited invite applications from graduate physicists or electrical engineers would good honours degree to work in their lamp works development laboratory on general lamp problems. Applicants with or without experience will be considered. Good prospects to a man wishing to make a career in industry. Superannuation scheme to which company contributes. Send full particulars of education and any practical experience to—Ref. LLD, Crompton Parkinson Limited, Guiseley, Nr. Leeds. 4627

DESIGN draughtsman required for M.V. and E.H.V. switchgear. H.N.C. or equivalent. Salary commensurate with qualifications. Pension scheme. Works in country situation, 20 miles from London. Accommodation can be arranged. Apply—Chief Engineer, J. G. Statter & Co. Ltd., Amersham Common, Bucks, marked "Confidential." 4666

DESIGNER-draughtsman required with experience of light electrical engineering. Apply giving age, experience and salary required.—Box 7556.

DESIGN draughtsman. A vacancy exists in our design drawing office for a first-class designer draughtsman for interesting work associated with the development of automobile electrical equipment. He should be at least of H.N.C. standard and experience in the design of light electrical equipment for large quantity production would be an advantage. The post provides excellent scope for initiative and advancement. Reply stating qualifications, experience and age, to—Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham, quoting reference PM/D/93. 143

DESIGN engineer, experienced in the electrical design of f.h.p. motors, required by progressive engineering firm. Salary according to age and experience. 5-day week. Pension and life assurance scheme. Please apply in writing, giving details of previous experience and salary required, to—Chief Engineer, Ranco Ltd., Industrial Estate, Newhouse, Motherwell. 4687

DESIGN engineer for either D.C. or A.C. medium-sized electric motors. The position offers attractive prospects. Apply giving particulars of experience and salary required to—The Secretary, Veritys Ltd., Plume Works, Aston, Birmingham, 6. 4600

DESIGNER required for work on medium and high-voltage power factor correction and furnace capacitors. Must have degree or H.N.C. or the equivalent in electrical engineering, and experience in the design and manufacture of medium/heavy electrical equipment. Good prospects. Write, giving full details of qualifications, age and salary required, to—The Technical Director, A. H. Hunt (Capacitors) Ltd., Bendon Valley, London, S.W.18. 71

DESIGNER required to take full responsibility for the design of all new boxes, cubicles and other fabricated steel assemblies required by the companies in the Metal Industries Electrical Division, namely, Brookhirst Switchgear Ltd. (Chester), Igranic Electric Co. Ltd. (Bedford) and Cantie Switches Ltd. (Bromborough, Cheshire). This is a senior appointment, tenable at the Chester works, carrying a good starting salary. Applicants must have had considerable experience in the design and manufacture of all forms of steel fabrication. Apply, stating age, qualifications and salary required, to—Technical Director, Brookhirst Switchgear Ltd., Northgate Works, Chester. 4590

DESIGNER-draughtsman required with good knowledge of the design of H.V. outdoor airbreak switchgear and/or 11-kV oil-immersed metalclad switchgear. Good opportunity for man with experience and able to work on his own initiative. Help given, if necessary, to obtain living accommodation. Apply in writing, giving full details of qualifications, experience and salary required, to—Switchgear & Equipment Ltd., Banbury, Oxon. 4601

DRAUGHTSMAN. Experience minimum 3 years of small and medium component design. Electrical experience, training and interests an advantage. Assistance given with housing. Apply in writing with full details of age, experience and salary to—Box 4558.

DRAUGHTSMAN required for detail work on specifications necessary for manufacture of paper capacitors. Write or call—A. H. Hunt (Capacitors) Limited, Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18. 95

DRAUGHTSMAN required for development work on low-voltage control gear. Mechanical background is required with sound electrical experience. Pleasant country surroundings, 1 hour London. Good working conditions. Canteen. Housing assistance if required. Please write, giving age, qualifications, past experience, married/single, present salary, to—Box 4573.

DRAUGHTSMAN required with good general knowledge of the design of special process machines and plant. Practical experience essential. Good working conditions. Pension scheme. Write for interview giving particulars of training and experience to—The Assistant Secretary, The Micanite & Insulators Co. Ltd., Empire Works, Blackhorse Lane, London, E.17. 4576

DRAUGHTSMAN/engineer required for works engineer's office of engineering company in Manchester. Experience in factory layouts and services and general engineering practice essential. Electrical knowledge desirable. Applications, stating age, experience, technical qualifications and salary required to —Box 4602.

DRAUGHTSMAN required for design and detail work on electrical/mechanical apparatus. Should be at least of H.N.C. standard. Workshop experience essential. Apply in writing to—Personnel Manager, A. H. Hunt (Capacitors) Ltd., Bendon Valley, Garratt Lane, London, S.W.18. 41

DRAUGHTSMEN required by South Wales Switchgear Ltd., at their Blackwood Works, Monmouthshire, for high voltage switchgear contract works and diagram sections. Applications, giving full particulars of experience, qualifications and salary required, to the Personnel Manager. 4667

DRAUGHTSMEN, senior and junior, experienced in the design of any of the following: (a) Air-break circuit breakers; (b) High-tension circuit breakers and metalclad switchgear; (c) Switch and control board layout; (d) Layout of industrial control contactor cubicles; (e) Diagrams of connections. Applications are also invited from draughtsmen who have had a good experience in genera mechanical work. Good working conditions, superannuation, etc. Apply giving full particulars to—The General Electric Co. Ltd., Witton, Birmingham 6. 4467

ELECTRICAL contractors in Midlands area require an experienced engineer. Applicants should have had a thorough training in the contracting industry and be capable of interviewing architects and consultants with a view to securing increased business. Salary up to £1,000 p.a. dependent on qualifications. Write in first instance, giving full details of experience and age, to—Box 4603.

ELECTRICAL draughtsman required in London for the design and layout of power and lighting installations and distribution systems, including preparation of estimates, etc.; H.N.C. qualification. Write stating age, qualification, experience and present salary to —Box 7906, c/o Charles Barker & Sons Ltd., 31, Budge Row, London, E.C.4. 4592

ELECTRICAL engineer, age 25-30, with good degree, preferably some experience in a research or development laboratory, is required for work on the application of electronic techniques to industrial measurement and control. The post is permanent, pensionable and offers good prospects. Apply in writing, giving full chronological details of qualifications and experience, together with age and salary required, to Tube Investments Ltd., Dept. of Development & Research, Plume St., Aston, Birmingham, 6, quoting Ref. F.2. 7560

ELECTRICAL engineer, not over 38, with sound scientific and engineering qualifications and commercial experience, required for Yorkshire factory manufacturing specialised electrical products. Salary based on qualifications and experience. The post offers good prospects for the right person, who must be available to commence on 1st November, 1954. Applicants should write, giving full details of age, education, training and experience, to—Box 4669.

ELECTRICAL engineer required by small firm in N.E. England to supervise the testing and control the quality of low tension control gear. Must also be able to calibrate and check electrical indicating instruments and to design and specify the grading of field rheostats for special purposes. Will be responsible for checking and correcting wiring diagrams, schematics, installation and maintenance instructions Applications, stating age, qualifications, experience and salary required, to—Box 4536.

ELECTRICAL engineer required for consulting engineers, London or Manchester, for inspection at manufacturers' works of electrical equipment for power systems. Higher National Certificate electrical engineering or equivalent essential. Write stating full particulars of education, experience and salary required.—Box 4670.

ELECTRICAL surveyor required by London insurance company for service in Newcastle. Age 26/30. Higher National Certificate and manufacturing experience of medium size motors. Knowledge of repair work and refrigeration an advantage. Salary £540 rising to £785. Non-contributory pension and other staff benefits.—Box 4572.

ELECTRICIAN wanted for London contractor. Must have thorough knowledge of trade. Write stating age and experience to—Box 4671.

EXPERIENCED instrument panel wiremen required S.E. London. Good prospects.—Box 7559.

ELECTRICAL draughtsman required Park Royal area. Should have experience in lighting and power installations for retail shops, manufacturing and processing depots; 5-day week; canteen. Good salary for suitable man. Pension scheme. Apply in writing stating age and experience, etc., to—United Dairies, Engineering Department, Cumberland Avenue, Park Royal, London, N.W.10. 4479

ELECTRICAL laboratory assistant required at the Norton works, near Worcester, of The Morgan Crucible Company Ltd. (head office Battersea, London, S.W.11). Age preferably under 30. Higher National Certificate or equivalent. Must be keen to study the unusual but interesting problems of the development and manufacture of ceramic resistors. The company has unlimited opportunities for good men. Posts permanent and pensionable. Salary according to age and qualifications. Apply to the Personnel Officer, giving full particulars. 4559

ENGINEER required for the development of a wide range of fractional horse-power motors. Experience of this work and H.N.C. (Elect.) or equivalent essential. Salary approximately £700 to start. Candidates, aged 25-35, should apply in writing stating age, education, qualifications and experience to—The Employment Office, Hoover Ltd., Perivale, Middx. 4382

EXPERIENCED switchgear estimating engineer for preparation of tenders for E.H.T. stations. Apply letter stating experience, age, salary—Switchgear Estimating, G.E.C., Witton, Birmingham, 6. 7557

FITTER (mechanical) required at East Yelland Generating Station. Applicants must be experienced in repair and maintenance of modern power station plant, and in particular of steam turbines, preferably of C. A. Parsons' manufacture. N.J.I.C. conditions, wages 45.00d. per hour. Application forms (A.E.6/M), obtainable from and returnable to the Station Superintendent, British Electricity Authority, South Western Division, East Yelland Generating Station, Nr. Instow, N. Devon, by 28th August, 1954. 4560

FULL-time representative required by leading manufacturers in switch and thermostat field for Northern Counties area. Contact with electricity boards and leading industrial organisations necessary. Reply with full details of experience aand remuneration expected to—Box 4672.

FULLY trained lighting engineer required for London office. Applicant must have good education and preferably be a member of the I.E.S. Apply—Senior Lighting Engineer, Ekco-Ensign Electric Ltd., 45, Essex Street, Strand, London, W.C.2. 4628

GENERAL manager for substantial firm electrical contractors, Home Counties, engaged all branches of industry. Exceptional opportunity for one possessing necessary qualifications and contacts. Applications in confidence to—Box 4629.

GRADUATE electrical engineer required in the Engineering Organisation of British Insulated Callender's Cables Ltd., at 38, Wood Lane, London, W.12, for development work on high voltage cables and accessories in the voltage range of 33 kV and upwards. Previous experience of cable work is not essential although it would be helpful. Pension fund; 5-day week. Apply in writing, stating age, qualifications and experience and quoting reference number L.43/54, to—Staff Officer, British Insulated Callender's Cables Limited, 21, Bloomsbury Street, London, W.C.1. 4660

INTERESTING post offered to experienced winder and fitter, capable of running f.h.p. motor repair shop in W. London as working foreman.—Box 7564.

JUNIOR assistant mechanical engineer wanted Westminster, must be good draughtsman and willing to go abroad short trips, if possible some experience electrical work. Applications giving brief particulars, to—Box 4539.

JUNIOR electrical engineer required for progressive company manufacturing mechanical handling equipment. Applicants should preferably be graduates and have completed compulsory military service. Duties will be varied and will include experimental and design work. Modern factory. Good working conditions. Canteen facilities. Please write giving all details to—Box 4574.

JUNIOR engineer (21-25) required in estimating department by elec. contractors (Westminster). Good prospects. Write stating experience, age, salary reqd.—Box 4501.

JOHNSON & PHILLIPS Ltd. have vacancies in their cable estimating department for young men, good mathematical standard essential. Preference will be given to men having experience in estimating costs of insulated electric cables and flexible cords. Applications in writing, giving age, experience and salary expected, to—Employment & Welfare Manager, Messrs. Johnson & Phillips Limited, Victoria Way, Charlton, London, S.E.7. 4561

LIFT erector and serviceman and experienced engineer required by Nottingham firm, able trace and rectify electrical faults in lift systems; permanency. State age, experience. —Box 4449.

LONDON office. Engineer, university graduate, full experience of design and construction of wood pole and steel tower transmission lines. State age, experience and salary to—Box E.R.176, c/o 191, Gresham House, London, E.C.2. 4562

MAINTENANCE electrician for large factory near Greenford (Middx.), preferably having experience with D.C. motors and control gear. Permanent position. Write fully to—Box 4630.

MAJOR oil company requires one electrical engineering draughtsman for work in London. Age 25 to 30 years. Candidate should possess the Ordinary National Certificate in Electrical Engineering or have equivalent qualification. Good practical experience required, followed by 3 to 5 years in the drawing office on electrical installations for process plants, workshops and factories. He will have opportunities of visiting refineries for periods of temporary duty. Opportunities for promotion to engineering appointments occur within the company and with its associates both in the U.K. and overseas. Write giving full details, and quoting H.2067, to—Box 6908, c/o 191, Gresham House, London, E.C.2. 4601

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TECHNICAL clerk required for estimating quantities and ordering conduit and wiring; practical experience of installation and ability to read wiring diagrams. Write age, quals. and salary reqd. to—Personnel Manager, Waygood-Otis Ltd., Falmouth Rd., London, S.E.1. 4579

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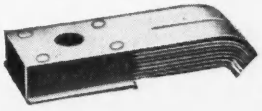

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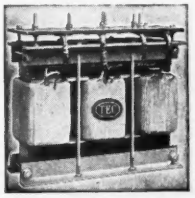

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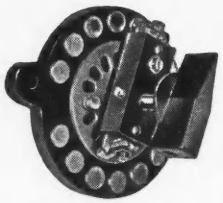

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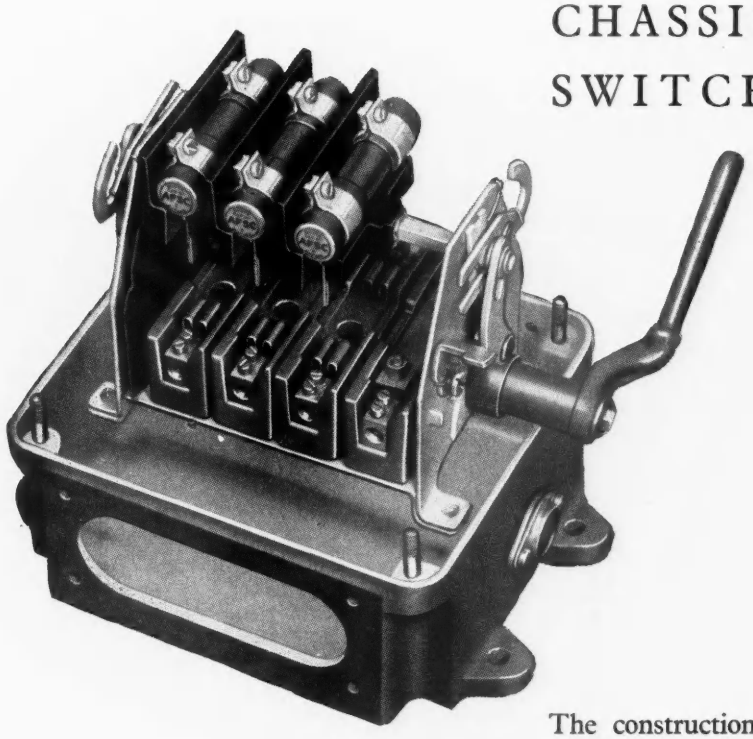

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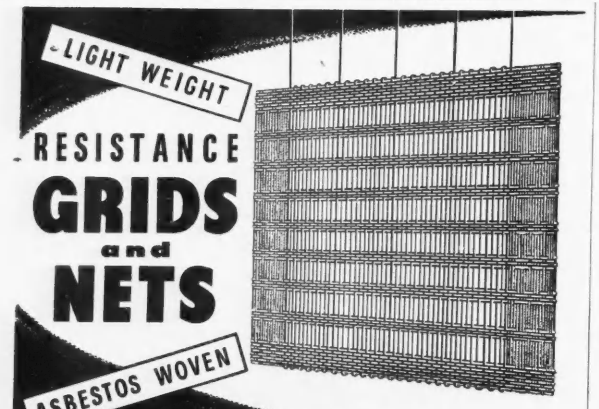

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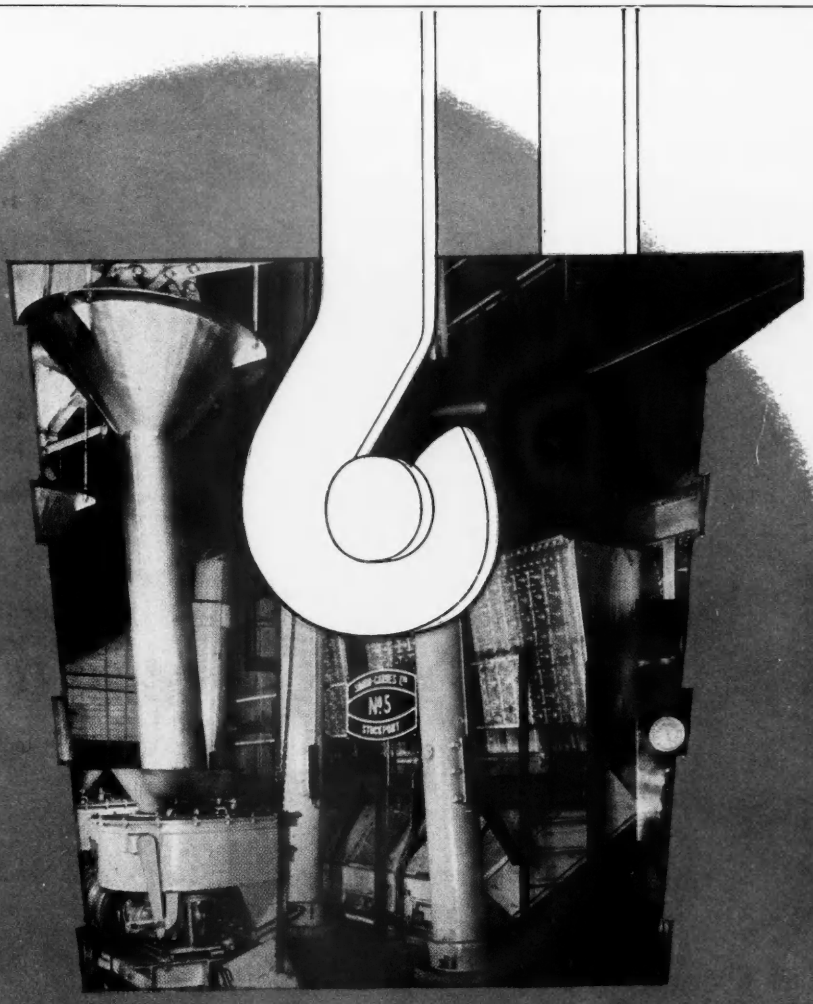

STEAM *and the making of steel*

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